Vol. XV, No. 3 DECEMBER, 1943

THE TOOL ENGINEER

OFFICIAL PUBLICATION OF THE ASTE AMERICAN SOCIETY OF TOOL ENGINEERS

Men Who Make Dreams Come True—The American Tool Engineers . . . . . *by E. C. Shultz*

Electronics Applied to Mass Production . . . . . *by Fred M. Burt*

Tooling for Peace . . . . . *by Nils H. Lou*

Die Sinking with Tracer Control . . . . . *by Anders Jansson*

The Use of the Diamond Pin in Locating Work . . . . *by Burton R. Garrett*

Industrial Engineering as Related to Industry . . . . *by W. C. E. Prins*

Automatic Multiple-Dip Pickling . . . . . *by John E. Hyler*

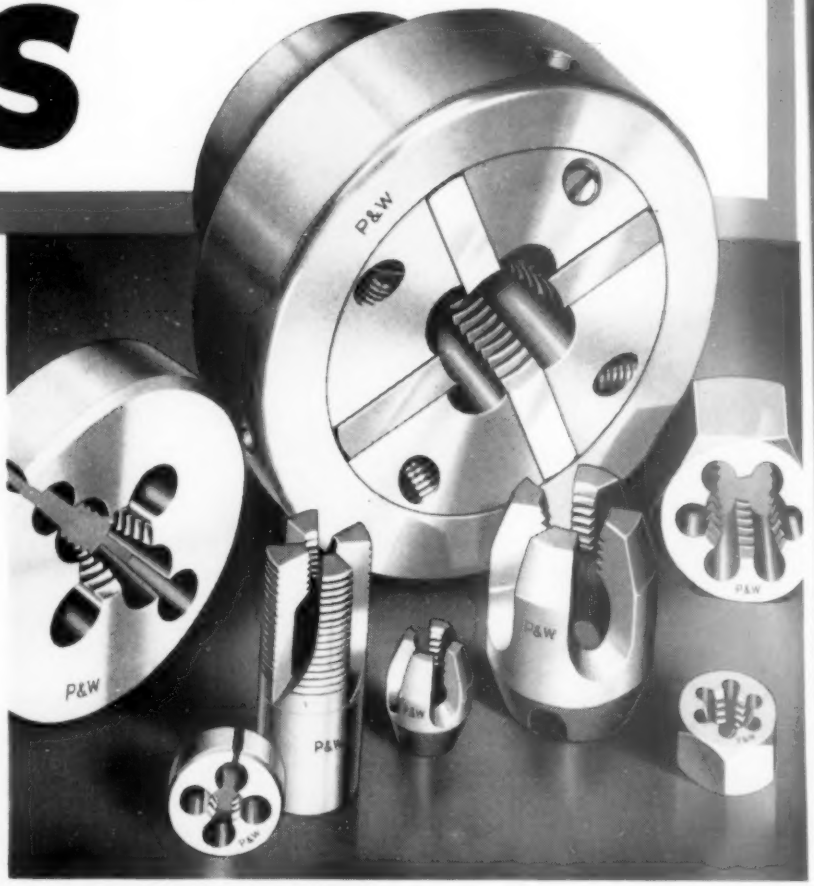
Departments

Fundamentals of Tool Engineering • A.S.T.E. News • Tools of Today • Good Reading • Gadgets • Bulletins and Trade Literature • North, East, West, South in Industry • Andygrams

Behind every product that is mass produced is the tool engineer

For Fast, Accurate Threading . . . be Sure to Specify P&W

DIES



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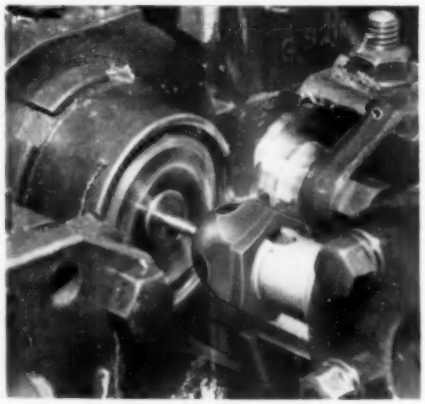

The P & W Duocone Die is light, strong, compact . . . designed for machine use. It is inexpensive and does a remarkably fast, accurate job of threading.

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Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

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THE TOOL ENGINEER

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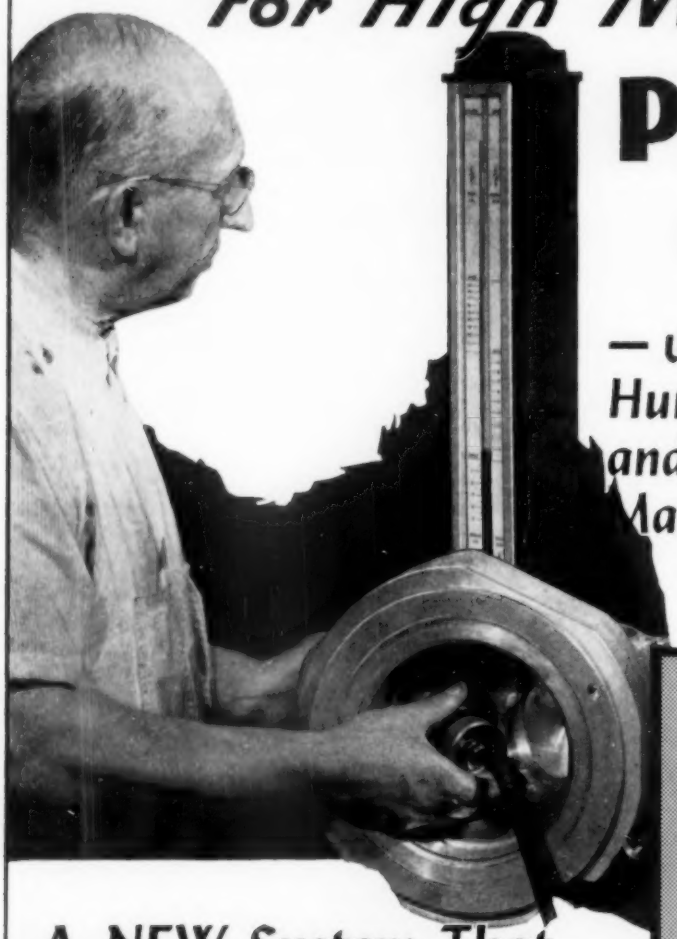
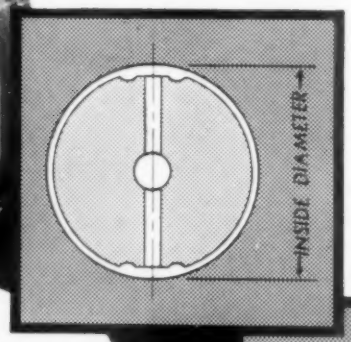
PRECISION GAGING

— with MINIMUM Human Influence and NO Marring of the Surface





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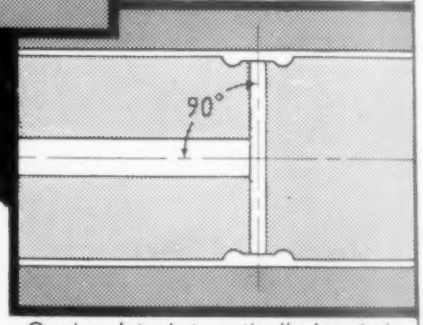
(.0001") *Looks like This* —

Actual Size

Gaging Jets Automatically Centralized in the Hole



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A NEW System That -

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This Federal Metricator Gage System reduces human influence to a *higher degree* than any other method; it *locates* the gaging head precisely. It has extremely *high* magnification. • The scale measures *direct* as well as compares dimensions. • Therefore, practical for selective inspection and Quality Control. • Only one master required. • Plugs are interchangeable *without* changing scale. • Tolerance maintained *regardless* of plug wear. *Several* dimensions can be gaged simultaneously.

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HARDINGE
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use HARDINGE Master Feed Fingers with Adjustable Tension

for

No. 00 and 0 Brown & Sharpe Automatics
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ILLUSTRATION IS ACTUAL SIZE FOR NO. 0 B&S AUTOMATIC

TWO FEATURES:

- You can set and lock finger to desired tension
- Selection of pads overcomes scoring of stock

In a conventional style feed finger, you have only <u>one</u> tension (usually arranged for the heaviest condition) while with Hardinge Master Feed Fingers with Adjustable Tension you can adjust to any one of the required conditions. The feed tube serves as a lock to maintain the predetermined tension. With the adjustable feature, you never have excessive tension and wear is held to a minimum. With adjustable tension, you never have insufficient tension; therefore, there is no stock slippage which causes short lengths.

The adjustable tension feature enables you to set the finger to the desired tension no matter what the variable may be. For example: With a given size of steel, aluminum or bronze bars and tubing, each has a different weight and requires different tension. Also, the length of the bars and speed of the machine have a bearing on the required tension.

Hardinge Master Feed Fingers with Adjustable Tension are adaptable to your exact needs as pads made from different material can be selected to suit the kind and size of stock you are feeding. This eliminates scoring of stock.

For literature describing and pricing Master Feed Fingers with Adjustable Tension, write to Hardinge Brothers, Inc., Elmira, New York.

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WHERE Public Auditorium Cleveland, Ohio

WHEN April 8-12 1946

WHO Leading Manufacturers and Industrial Engineers

WHY To Exhibit *New Era* Production Equipment and Processes

For full information write to

AMERICAN SOCIETY OF TOOL ENGINEERS

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Sizes 1.510" to 6.010"
(38mm. to 152mm.)

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Chamfered edges automatically wipe bore and help prepare a clean surface for accurate gaging.

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AMERICAN TOOL ENGINEERING COMPANY

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PRODUCTION PLANNING · OPERATION SHEET WRITING · TOOL DESIGNING
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To Manufacturing Executives:

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It is for this reason that your current design and production problems merit the most careful and capable attention, the most mature judgment for their solution.

Check over our multi-services listed at the right. Any of these services—any combination of them—are available to the manufacturer who is foresighted enough to see the wisdom of placing his problems in the hands of an integrated group of specialists in such problems—specifically, our large staff of engineers, designers, practical production men, draftsmen and technicians. Their rich and varied experience in solving war production problems is now being applied successfully to the working out of engineering requirements in the reconstruction era.

If you are interested in any of these services as applied to the present and future needs of your business—an inquiry by letter at this time may prove a profitable move. It will receive prompt attention and there is no obligation implied.

Very truly yours,

AMERICAN TOOL ENGINEERING COMPANY

BY Thomas P. Orchard

Thomas P. Orchard
Gen. Mgr. & Partner

AMERICAN Tool

PRODUCT DESIGN

PRODUCT DEVELOPMENT

TOOL DESIGN

PRODUCT PLANNING

INVENTION DEVELOPMENT

GRAPHIC ILLUSTRATION

OPERATION SHEET WRITING

DESIGN OF SPECIAL AND AUTOMATIC MACHINERY

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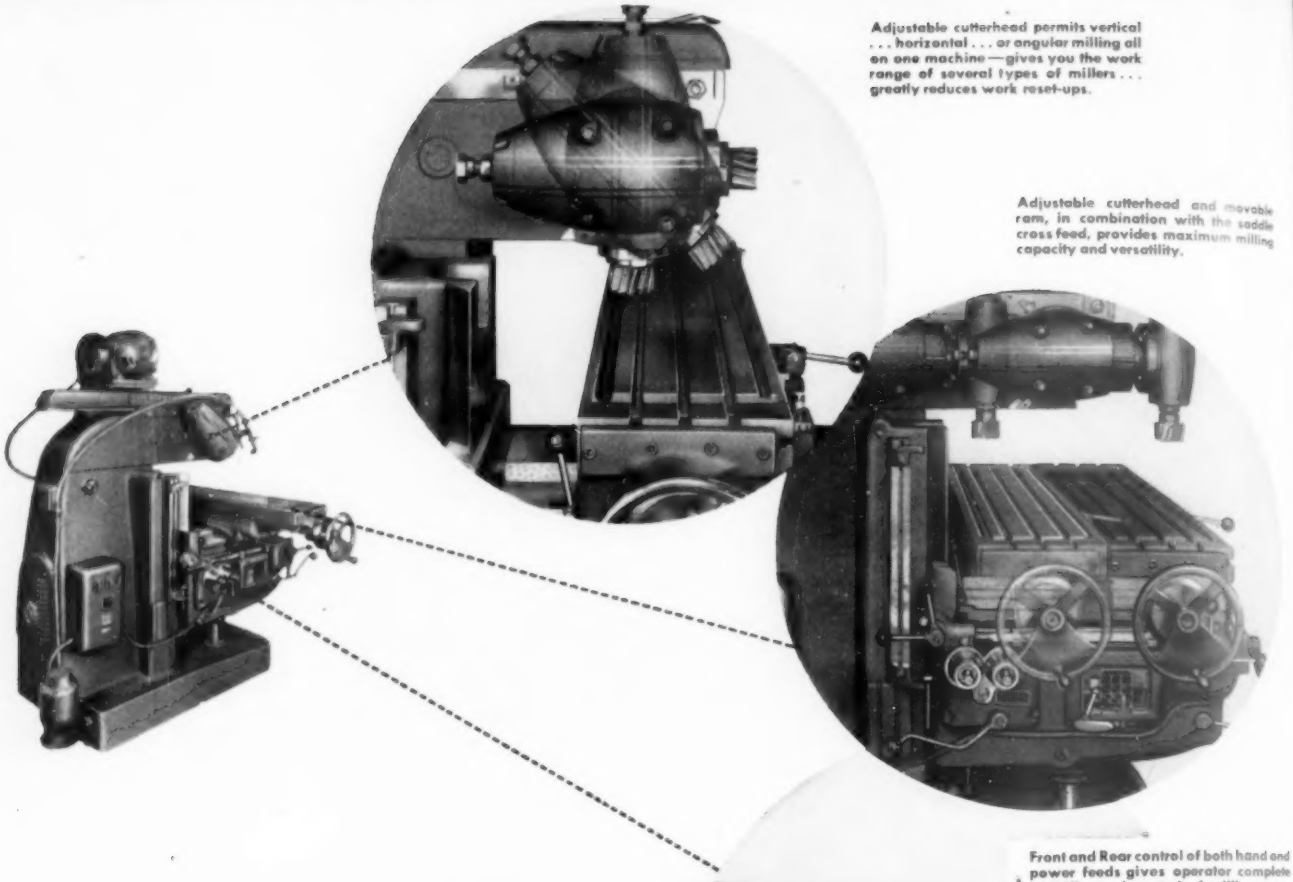
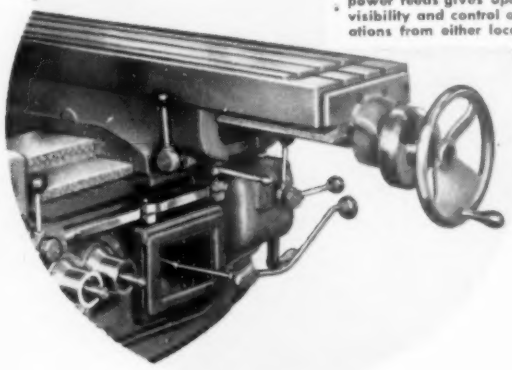
1974 BROADWAY, NEW Y



Adjustable cutterhead permits vertical . . . horizontal . . . or angular milling all on one machine—gives you the work range of several types of millers . . . greatly reduces work reset-ups.

Adjustable cutterhead and movable ram, in combination with the saddle cross feed, provides maximum milling capacity and versatility.

Front and Rear control of both hand and power feeds gives operator complete visibility and control of milling operations from either location.



VAN NORMAN

RAM-TYPE

MILLING MACHINES

Give Your Operators

Every Advantage in Tool Room and General Purpose Milling

The new Van Norman Ram-Type milling machines will not only do your present war work for you but will also *fit into your production scheme when you reconvert.*

Whether you need one or a dozen, each of these versatile millers gives you the working capacity of three machines. The adjustable cutterhead enables your operator to do vertical, horizontal or angular milling. This means that work re-setups are minimized since most jobs can be carried through completion in the original setup.

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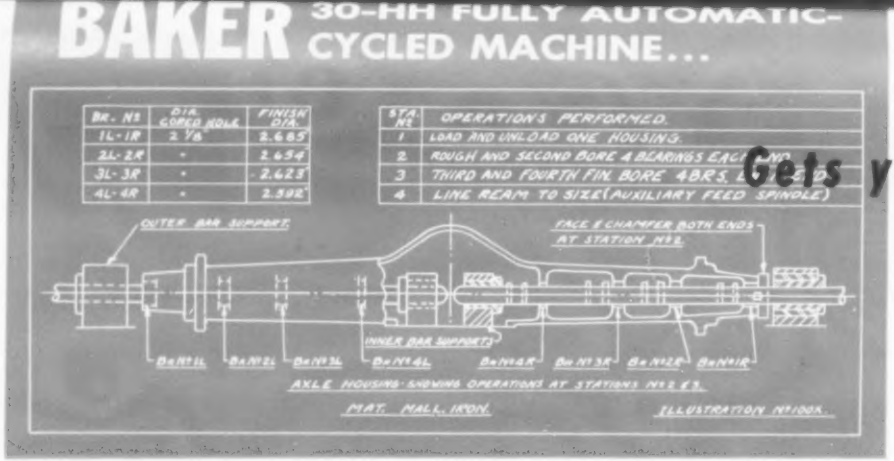
"It pays to Van Normanize"

BAKER 30-HH FULLY AUTOMATIC-CYCLED MACHINE...


BR. NO | DIA. CORED HOLE | FINISH DIA.
1L-1R | 2 7/8 | 2.685
2L-2R | " | 2.654
3L-3R | " | 2.623
4L-4R | " | 2.592
STA. NO | OPERATIONS PERFORMED.
1 | LOAD AND UNLOAD ONE HOUSING.
2 | ROUGH AND SECOND BORE 4 BEARINGS EACH END
3 | THIRD AND FOURTH FIN. BORE 4 BRS. EACH END
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OUTER BAR SUPPORT
FACE & CHAMFER BOTH ENDS AT STATION NO 2.
INNER BAR SUPPORT
AXLE HOUSING SHOWING OPERATIONS AT STATIONS NOS 2 & 3.
MAT. MALL. IRON.
ILLUSTRATION NO 1005.

Gets your products out quickly for those who have waited so long for them

Specially furnished for multiple operations on malleable iron Axle Housings for Trucks, this Baker 30-HH Hydraulic Feed Two-Unit Two-Way Horizontal Machine was a real "producer" of vital war goods, and is now a sure profit-maker for civilian production! Its flexibility and versatility are the features that guarantee extra advantages to the maker of fine products under postwar competition. The fully automatic cycle results in considerably higher production than could be achieved by conventional methods . . . also greatly reduces the human element and minimizes operator fatigue.

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At each machine cycle, one Axle Housing is completed with four cuts in each of the four bearings at each end of Axle Housing, in addition to final reaming-to-size operation at last cutting station. The two spindles at each opposed head on main saddle of hydraulic feed unit are used for operations at Stations 2 and 3. At last cutting station, each opposed head is furnished with independent auxiliary long-travel spindle carrying multiple-blade reamer head for each one of four bearings at each end of housing. Machine is fully automatic with electrical inter-locks. Bars at Stations 2 and 3 move into cutting position stationary, non-revolving—to allow inside cutters through previous bores. Note slight difference in finished diameters on each bore (see table above). Bars move into Axle Housing to cutting position with Housing indexed slightly off working position. When bars are in position, trunnion is carried into actual true cutting position, and bars automatically start in rotation and automatically engage into feed. At end of cut, automatic trip and fully automatic cycle reverse the starting cycle. Production is considerably higher than where operator of single-spindle machine has to insert each bar through bores, then start machine.

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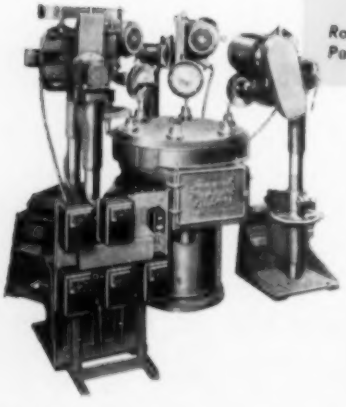

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Rotary Automatics for hi-production Polishing, Buffing and Deburring.

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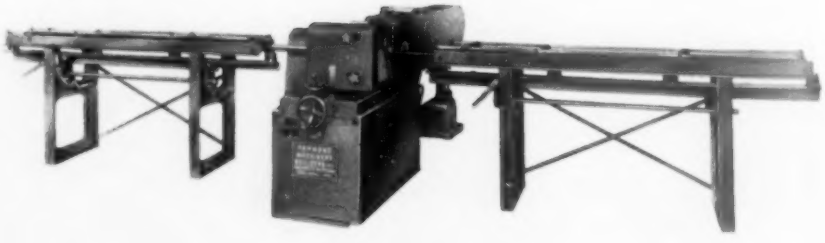
"OD" Cylindrical Finishing with wheels or abrasive belts — handles tubes, rods, bars and other Cylindrical shapes.



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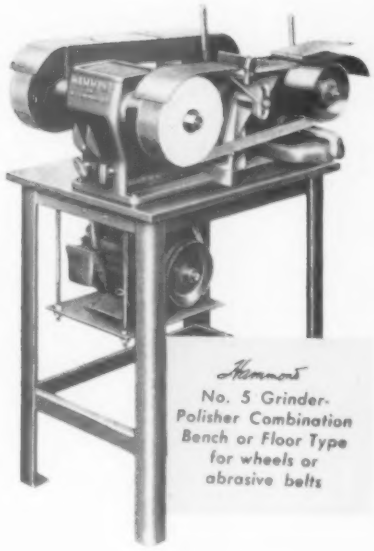
Hammond F-2 Flexible-Belt Grinder. Bench or Floor Type.



Hammond No. 5 Grinder-Polisher Combination Bench or Floor Type for wheels or abrasive belts

# of KALAMAZOO

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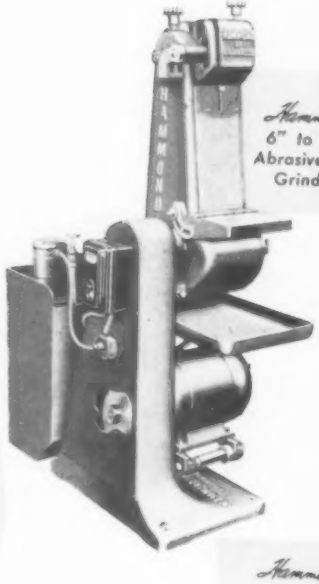
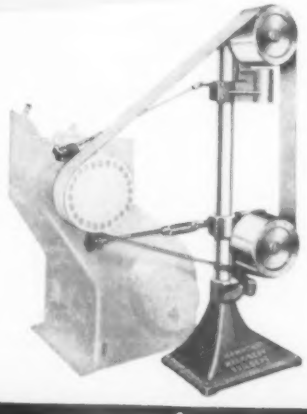
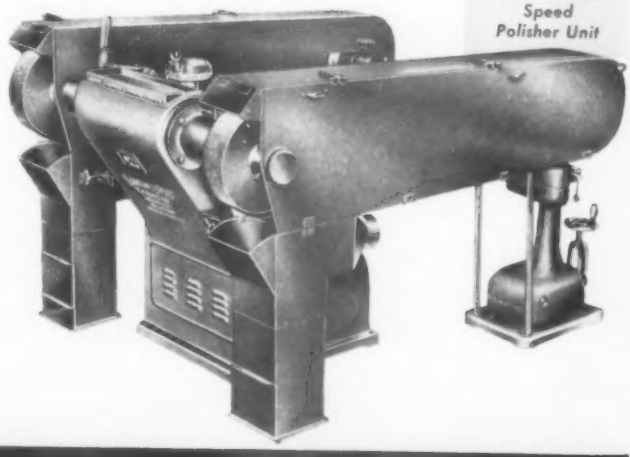


Hammond 6" to 10" Abrasive Belt Grinders



Hammond No. 4 BACKSTAND For use with abrasive belts



Hammond No. 3 BACKSTAND and Variable Speed Polisher Unit

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Milwaukee

Precision Milling and Boring Machine

No. 3 MODEL T

Precision Milling plus Precision Boring — performed in one setting of the workpiece — results in greater accuracy in the finished product. That is the contribution this machine offers to economical production of parts requiring precision milling and boring operations.

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- Precise machine alignments and measuring devices to assure highly accurate results.
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- A No. 50 National Standard spindle nose that accommodates modern milling and boring tools.
- Centralized boring head controls, dual table controls and a swivel control pendant provide for easy and rapid operation.

Again Kearney & Trecker engineers have proven their skill in the design and proportioning of this machine tool. Constructed on the unit plan this machine is characterized by its rigidity — ease of operation — and precise results. Write for descriptive catalog No. T10.

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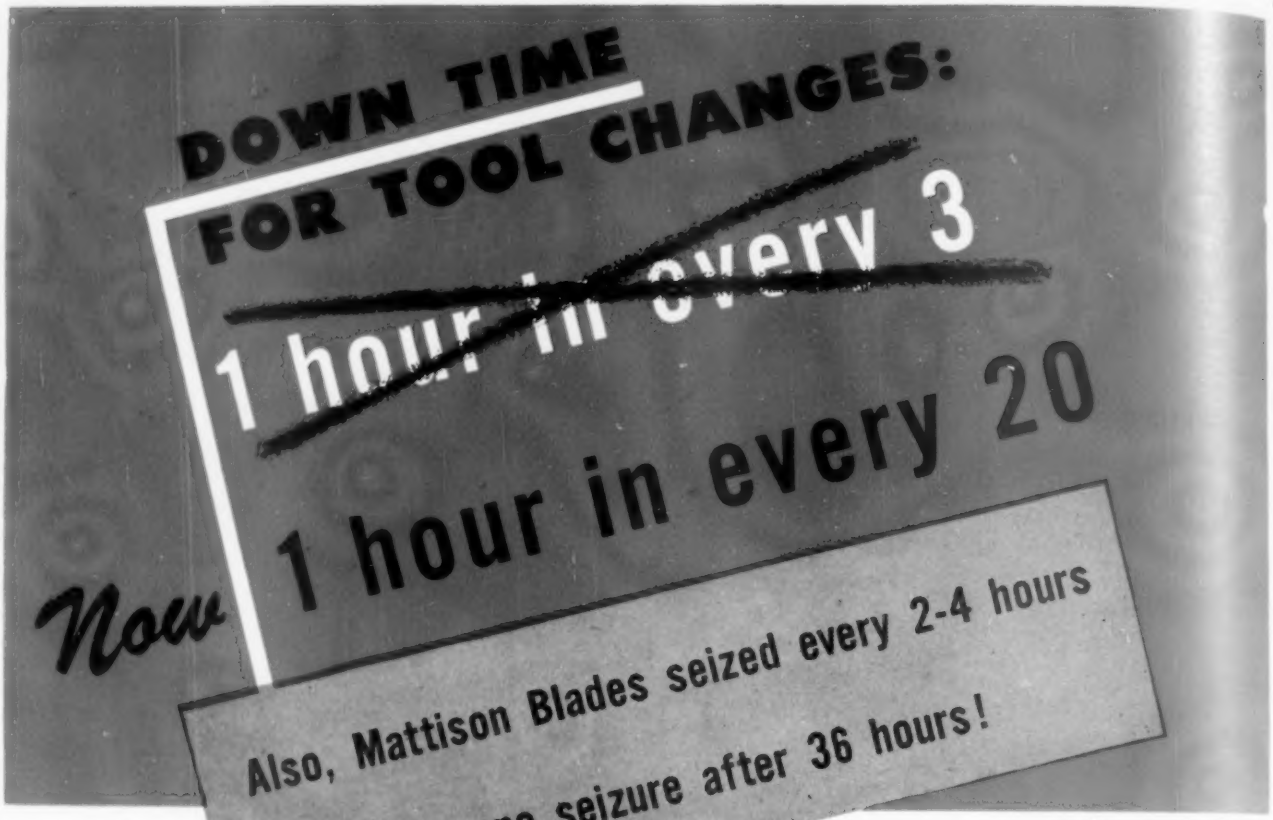
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Men who make dreams come true

...The American Tool Engineers

This glowing tribute to the Tool Engineers and to the American Society of Tool Engineers is reprinted from Vol. III, No. 3 of the Pratt & Whitney publication, BACKGROUNDS. While the author did not take a by-line in the original article, we have since ascertained that he is E. C. Shultz, Advertising Manager of the Pratt & Whitney Division, West Hartford, Conn.

Together with grateful acknowledgement of permission to reprint, we also wish to express our appreciation for the use of the original art work. On the whole, the reprint and illustrations, together with the boxed "Salute" to the A.S.T.E., closely follow the original article.

Ed.

THAT glistening refrigerator in your kitchen . . . the clear, full-toned radio that keeps you in touch with world happenings and brings you entertainment at the push of a button . . . the family car that has given such dependable service through extra war years—for these and hundreds of other taken-for-granted peacetime luxuries we've had—thank mass production under the guidance of the tool engineer.

The inventor can conceive a new product . . . the designer can make it workable and give it physical appeal . . . but it remains for the tool engineer to work out the ways and means of mass-producing it so that its price won't put a permanent crimp in your pocket book, and so millions can enjoy it instead of a mere handful.

These same tool engineers are directly responsible for America's miracle of war production . . . for they practically removed the word "impossible" from the dictionary. Behind the vast fleets of ships, the staggering quantities of guns, tanks, planes, ammunition, and the whole list of war matériel lies the skill and almost incredible resoucefulness of tool engineers. They literally "tooled up" American industry for war—and they did it at a speed our smart enemies believed impossible.

ASTE

Our hats are off to the American Society of Tool Engineers. This group of men is vibrant, dynamic, and is growing swiftly in thinking, in stature, and in importance. Starting but 13 years ago, the ASTE now has a membership of over 18,000 . . . has increased 15 percent within the last year. Probably no other group of men in America has a greater influence on material progress. For them we predict a long and illustrious future.

A New Profession

Tool engineering can hardly be described as something new. Knives and forks are tools. Most of our great industrialists—men like Henry Ford—have been instinctively tool engineers. Yet tooling up has certainly swollen in importance in recent years . . . industry has come to rely on the tool engineer with a completeness that has made his work take on the stature of a profession.

The tool engineer is the hub of our whole modern production wheel. His is the job of determining how a given product can be produced accurately and efficiently, at a cost that will make it saleable to the public in sufficient quantities to make its manufacture practical and attractive to management. That is a job!

Let's take a quick look at the job and what this man must be. We can only generalize here because each shop presents its own detailed problems to which he must adapt his endeavors. Obviously, he must know his product . . . the "why" of each part and the tolerances involved. Those tolerances (and they are narrowing every day) are his particular headache to maintain by means of his tooling methods. He must know how many of each part are needed . . . and when . . . and provide accordingly. What he provides—the intricate combination of jigs, fixtures, tools and machines is his main job—he must design and see built as he wants them and knows they must be. Perhaps he must adapt existing equipment to his needs. Perhaps he is hedged by a fixed amount allotted for tooling and must spread it around where it will do the most good. In any case, what he spends is an expense that must justify itself in cold hard dollars on the balance sheet.

From his knowledge of the limitations of processes and machines for quality, productivity, and operation, your tool engineer must make correct selection. He must know what tool, what cutter, what grinding wheel, what lap, what hone, what fitting tools, what polishing means will do the job. He must know his coolants, lubricants, feeds and speeds, operator skills, hand skills . . . and if they are available. He must also know what to do to keep the process and machines running to maintain quality and productivity . . . what to do when break-

The Pattern of Teamwork

WHEN it comes to cooperative activity in the industrial history of our Nation, no finer example exists than that of the numerous wartime "Aircraft Councils." Through these Councils filtered much of the know-how bearing on the production of aircraft. This ran the gamut from engine and airplane producers (who had been in the business a long time) to the motor car and truck industry. While the airplane was a new product to them, they did possess the all-important know-how of mass production. Also contributing valuable ideas, methods and tools were the many equipment producers. It was the final objective of all these manufacturers to give the Armed Services of the country every type of airplane needed to humble and defeat the enemy.

In order to coordinate the highly specialized experience and talents of these various aircraft builders and suppliers, the Aircraft Council had an all-important task throughout the wartime years. Today, these Councils are no longer in existence. The purpose for which they were created has been accomplished.

The principles of two-way cooperation and the pattern of teamwork on which these Councils operated can well be adapted to serve in a postwar world.

Harry E. Conrad was largely responsible for the engineering and building of the phenomenally successful pattern for teamwork which characterized the Central Aircraft Council. On November 12, Mr. Conrad became the Executive Secretary of our Society. It is only natural that the pattern of success which identified all the work of the Council during the time it was in existence will bring direct benefits to our Society and to our members in the United States and Canada.

At the outbreak of the war, Mr. Conrad was a partner in a management company in New York. With this organization it was his assigned task to organize small industrial groups in order that they could operate more efficiently in competition with larger and more powerful organizations.

He joined the staff of the Automotive Council for War Production at the beginning of the war for the sole purpose of organizing committees to exchange knowledge and information that would be helpful, first, to speed conversion to war production and, second, to speed the production of war armament itself.

His task with the Society as Executive Secretary is pretty much the same in its basic fundamentals. Instead of a "steering committee" he now works with our group of national ASTE officers. The "member companies" of the Council are now the Society Chapters. The men of those companies are now the members of ASTE. Many of them are even the same men. The "Aircraft Council" is now ASTE Headquarters. His assigned task: to coordinate and help maintain cooperation throughout the Society and to spearhead, engineer and build a pattern for teamwork for the Society.

As members of ASTE, we have one common purpose—to raise and maintain the standard of tool engineering as a profession and of tool engineers as individuals. That avowed purpose takes teamwork—teamwork that is intelligent and unceasing. It is this pattern of teamwork which we are constantly striving to achieve and maintain while at the same time raising the reputation of ASTE to new heights.

In Mr. Conrad as our Executive Secretary we have a man of unusual experience, talent and diligence. He is here to serve us all as individuals, as Chapters, and as a Society. Like a great river carrying the commerce of a Nation, a professional Society such as ASTE never stands still. To call a halt to our visions and to our undertakings means stagnation. To plan, to build, to constantly strive means progress.

C. N. Brinsmade

down occurs. He must know when equipment is outmoded or worn out . . . whether it meets with estimated life or not . . . when to retool. His recommendations should be heeded and followed.

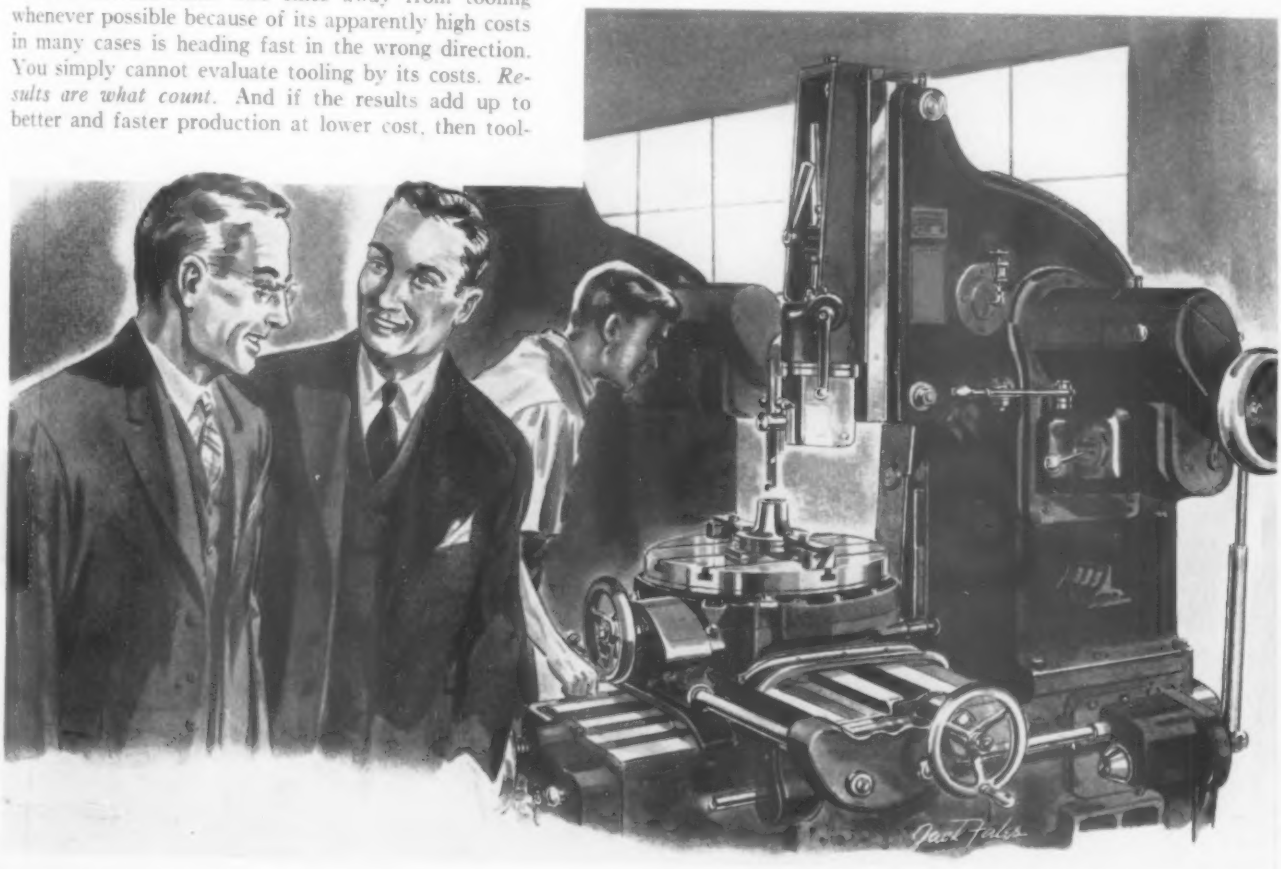
He must keep up to date on a mass of development in methods, materials, tools, gages . . . and know when to use "the other fellow's stuff." And perhaps he is the kind that develops "stuff" of his own . . . ideas that contribute to better and faster methods of producing. Sometimes his duties include installing proper gages and inspection methods to govern part production . . . but more often in larger shops this becomes the job of a gage specialist working under the tool engineer. Mix all these ingredients with a flair for hard work, the love of a good mechanic for a job well done, and a dash of ingenuity that can get around the tough problems, and you come out with an American tool engineer. He's quite a guy!

Most important of all these varied duties is the designing of proper tools, and it is here that his creative skill comes into its own. He can and does devise ways to save time and cut costs . . . to make practical a seemingly impractical manufacturing step. He must know materials as well as machines, must be thoroughly familiar with the management set-up and sales problems as well as shop layout, for each phase of the entire manufacturing process in one way or another hinges on his decisions.

No Price Tag on Tooling

The manufacturer who shies away from tooling whenever possible because of its apparently high costs in many cases is heading fast in the wrong direction. You simply cannot evaluate tooling by its costs. *Results are what count.* And if the results add up to better and faster production at lower cost, then tooling is accomplishing its purpose. It takes only a small saving per piece in mass production quantities to add up to the entire tooling cost plus a fat profit. That is why wise management is looking today upon tooling as the most productive form of expenditure it is possible to make.

Some aspects of tool engineering can be worked out in advance on paper so that management can be assured to the penny exactly how practical a proposed step would be. Take, for example, a certain important part for a washing machine. The tool engineer finds that with the use of a certain fixture

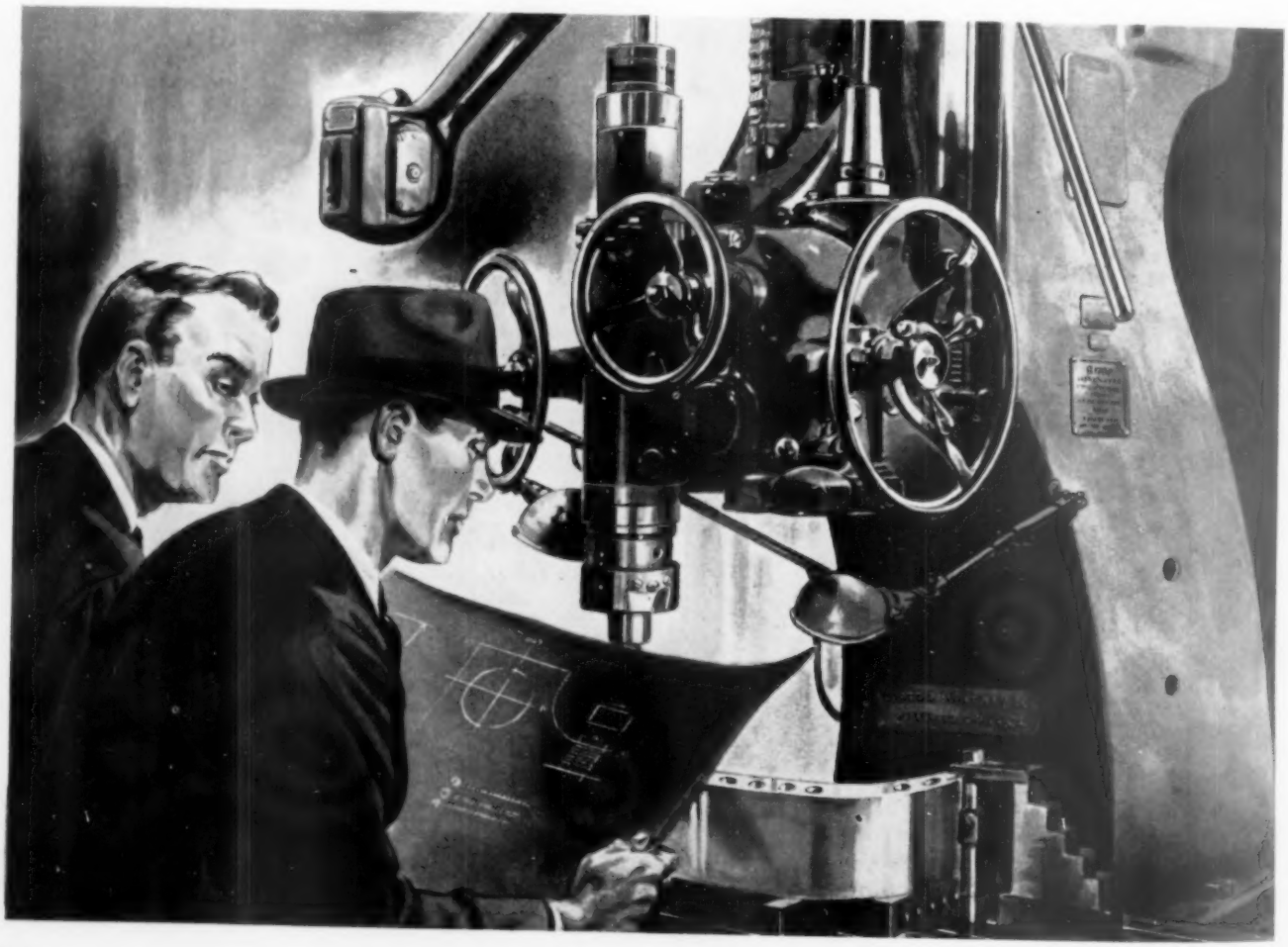


this part could be produced in less time. Then, figuring the cost of the fixture itself, he can determine exactly how many parts must be produced before the fixture pays for itself. He will know how long it will take before the fixture shows a profit and what the ultimate saving will be. Management likes this kind of assurance . . . it isn't always possible, but the wise tool engineer justifies his work in advance whenever he can.

Made—Not Born

The tool engineer is a specialist —a specialist in the design and application of tools, machine tools, jigs, dies, fixtures, and other manufacturing equipment plus inspection equipment. He gains his knowledge by *doing*. But such is the swiftly increasing recognition of his importance that already courses in tool engineering are under way to train men in the basics needed to become an accomplished tool engineer. He must, of course, be mechanically minded . . . must have an ingrained love for machines and tools.

For years, tools and machines for production have undergone revolutionary changes . . . in many cases, particularly during the war, these changes have been extremely rapid. There is still room for improvement. There always will be. New discoveries and evolutions in materials, for instance, open up new possibilities for tool engineers. Plastics, rubber and glass pose new problems. And the never-ending flow of new designs, new product, call for the utmost in ingenuity to devise time and money-saving short cuts. There is no end to the need for the accomplished tool engineer . . . and now that peacetime production has finally arrived, he will be as important as any man in the plant.



The Picture for Tomorrow

It took a war to gain full recognition for the tool engineer. And what he will contribute to the peace has no limits. For the war has speeded development of new products and new processes that otherwise might have been delayed. The war has uncovered new materials and new achievements that were unknown a few short years ago. And the problem for the tool engineer lies in applying these new discoveries to peacetime production . . . to make hundreds of new dreams come true for millions.

Aluminum, magnesium, plastics synthetic rubber, and other materials have revolutionized aircraft manufacturing almost overnight. Finer precision, better means of measurement, plus faster, more efficient methods of achieving precise work have upped the standards by which we will plan and judge our products to come. Electronics has put on a burst of development speed that will strongly influence thousands of peacetime products.

Imagine the progress that will reveal itself in the field of home appliances, in the new automobiles and radios, in air transport, and the thousand and one other item that, thanks to the tool engineer, have changed from luxuries to necessities. Once again, we will turn to the engineer to bring us these still finer and more advance products at prices within everyone's reach.

It is safe to say that, probably more than any other science, tool engineering has given America the highest standards of living in the world. And as it has so effectively helped us win the war, so will it help us build an enviable peacetime future.

Your successful tool engineer is one of your most priceless assets . . . be sure to recognize that and treat him accordingly. It will pay off for you many times over. Class him as a senior executive . . . see that he is present at management meetings . . . give him the pay that is in keeping with his importance, and enough help to meet time requirements. Your tool engineer is vital to the success of your manufacturing. He can help you meet and beat competition by lowering your production costs. He can show startling results if you will let him work with your designers, because often a slight change that has no effect on the design can save many dollars in tooling and manufacturing. If you can weld your designers, tool engineers, and production men into a team that works together without "professional jealousy," you will win. "Utopian," perhaps, yet something to think about. But your tool engineer is the key man. Make the most of him.

By Fred M. Burt

Electronics Applied to Mass Production

MR. BURT

IN a rather widespread check on the use of electronic equipment, as applied to manufacturing in the Los Angeles industrial area, it was found that there are a large number of such uses, but widely scattered. There are many applications in the movie industry—more than in any other in this area—but since they do not fall in the classification of industrial production, they were not included in this investigation.

The general picture at this time, as determined from a number of industrial contacts, and from advices given by engineers of several of the leading manufacturers and installers of electronic equipment—as Westinghouse, General Electric, R.C.A., Electron Equipment Co., and Cutler-Hammer—is one of rapidly increasing expansion. Much equipment is on order and will be used for a wide variety of productions. In most cases the new installations will be made in plants where some use (often but a single one) is now made of electronics.

Of major consideration, here are the processes of education, analyzation and evolution. Many persons have formed over-optimistic misconceptions of the capabilities of electronic equipment. There is a prevalent belief that it may be used, in various forms, to perform too many marvels of production by supplanting or supplementing other automatic or semi-automatic operations, with an extraordinary increase in efficiency, elimination of manual labor, and with almost superhuman selectivity. This is often true, but in many cases would require expensive engineering and special installations that would have a cost entirely out of proportion to the benefits derived—a matter of, say, spending $50,000 to do a $1,000 job.

But, eliminating any fanciful dreams (some of which may in time come true), the potentials of the use of electronics in down-to-earth applications are infinite in variety and number. Many electronic specialists—engineers with imagination, yet with fine technical and practical knowledge of the many ways this technique can be used, in its various phases, to effect controls providing the utmost in precision, speed and flexibility—are doing a thorough job in spreading and diversifying the use of electronic equipment.

In most of the plants where the installation of such equipment may be advisable, electrical engineers—and electricians—are avidly and intelligently interested and work cooperatively with the electronic specialists to analyze operating details, with subsequent recommendations for installations. All this indicates that there will be a tremendous increase in the number of such units in the future.

Industrial Expansion Diversified

The Los Angeles industrial expansion has been of such great diversification that the most of today's practical uses of electronics, in industry, have logical points of application in many of the thousands of local plants. While other employments of electronic principles may have indicated industrial applications, the equipments that are of the greatest practical value in production today—or will be in the near future—are those used for welding, heat treating, positioning, speed matching, current and voltage control, temperature control, color matching, motor control, counting, process control, inspection, measurement and testing, power rectification and frequency changing, industrial x-rays and precipitation. The performance of these functions by electronic equipments, when indicated, attain perfections of speed, precision and efficiency, otherwise unattainable.

Before going into detailed descriptions of some specific electronic applications in production, a few primary facts and definitions will be given. The great electric pressure of a stroke of lightning forces its electric current to pass through the air. Inside any radio tube, similarly, tiny electric currents are made to pass through the space separating certain parts of the tube. This action of electricity flowing through space, instead of being confined to metal conductors or circuits, is electronic.

Electronics Defined

Today, we believe that any electric current is made up of countless numbers of tiny electrical particles called electrons. When they come out of conductor metal into space, the action is called electronic and the device that controls such a flow of electrons is called an electronic device. In ordinary air, electrons can only be made to jump through space by the pressure of high voltages. But, if they are enclosed in a tube from which the air has been removed, they flow across this space more easily. The small tubes are vacuum tubes while the larger ones usually contain mercury or other vapor with a slight reduction of the vacuum, and are called vapor-filled tubes. They can handle much larger electric currents.

Electric lights give good comparisons. The common incandescent light, even though enclosed like a radio tube, is not considered electronic as the current flows entirely within the metal filament. The fluorescent lamp, however, is electronic, for the light is produced by the action of electric current flowing through space between the two ends of the lamp.

Following are five important ways in which electron tubes give operations unequalled by other kinds of electric equipment:

(1) Electron tubes respond to small control signals and produce a corresponding, but larger signal, thus greatly amplifying the input signal.

(2) Electron tubes can respond at speeds far beyond those attained by the most sensitive moving devices.

(3) Acting at high speeds or high voltages, electron tubes can produce special radiations (such as radio or x-rays).

(4) Some kinds of electron tubes respond to light, serving as "electric eyes."

(5) With alternating voltage applied, electron tubes can carry current in one direction, while refusing to carry it in the opposite direction. In this way, tubes change or rectify alternating current into direct current.

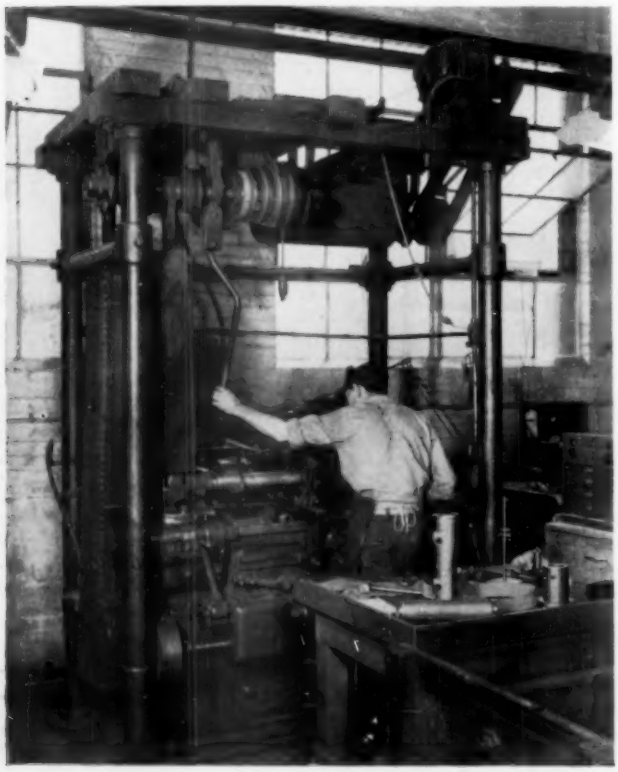
One of the more widely used electronic devices in industry, is the stepless, precision motor control with A-C power. In the plant of the Axelson Manufacturing Company, Los Angeles, manufacturers of engine lathes, deep well pump liners, castings and other products, this application of electronic control is demonstrated in the operation of grinding machines. The countershafts on three old No. 70 Heald grinders with their five-speed belt drives—See Fig. 1—were replaced with Westinghouse electronic drives. The clutter of overhead and supporting equipment and framework was removed and supplanted by the very much simpler and non-bulky "packaged drive," consisting of the one H.P. D-C motor and Push Button Speed Control Station mounted on the machine, with the Mot-O-Trol Cabinet containing the electronic control panel and the power transformer out of the way on the wall nearby. The three grinders, similarly equipped, are used for internal grinding of pump liners, for various tool room jobs and for production grinding of ring and other gages. All of these usages require a variety of speeds depending on the particular jobs being done. It is essential that any desired speed set on the control dial shall be maintained as a constant regardless of the load. The electronic control provides this constancy by compensating for added load by the instant addition of a current input necessary to maintain the set speed but without increasing it.

Slight Initial Time Delay

Power is taken from an A-6 line and rectified by two 672 thyratron tubes to supply the regular, shunt-wound D-C motor for armature current control, and this voltage may be varied from zero to motorrated voltage. Smaller, 866 thyratron tubes provide rectified D-C field current. The field voltage is held constant throughout the range of armature voltage and then is reduced to provide greater speed range by field weakening above the base speed (1750 r.p.m.) of the motor. The normal speed range by armature control is 20-to-1, below the base speed of the motor. Field control is used above the basic speeds.

FIG. 1, left. No. 70 Heald Grinder at Axelson Mfg. Co., before conversion to Electronic Mot-O-Trol drive and control. Note the overhead mechanism and supports.

FIG. 2, below. Heald Grinders after conversion to Mot-O-Trol drive and speed controls. Note small amount of space occupied by motor and electronic equipment.



An initial five minute time-delay period is required for the tube warm-up. The time delay relay contacts are in the field control and armature control circuit so that the "Start" push button is not effective until the initial warm-up period is over. However, this time delay need only occur once after the line switch is closed. Thereafter, a continuous heating of the tubes is maintained even when the motor is stopped.

Speeds may be pre-set, within the desired range, simply by setting the dial control (which is calibrated clockwise) from 1 to 100, with the setting at 100—i.e., that of the basic, 1750 r.p.m. speed of the motor. Speed adjustments may be made at any time while the motor is running. Current limiting relays cushion the motor against overloads, and are of special necessity when reversing equipment is added. With the latter, the motor may be instantly reversed simply by pushing the Reverse button. The motor is quickly stopped (in about four revolutions) after pushing the "Stop button, by a dynamic braking resistor that is not in the motor circuit during running conditions. The amount of braking resistance is adjustable.

Range Stepless; Speed Constant

The foregoing illustrates how a motor drive speed may be set in a stepless range and maintained as a constant regardless of load. In the Axelson Heat Treat Department, the same principles are also applied to the maintenance of constant temperatures without perceptible variations, again compensating for added loads by the increase of voltage and current input. This application controls a General Electric Globar Heat Treating furnace (See Fig. 4) of 36 KW rating, with a heating range up to 2500-degrees F. and 14" x 24" hearth. It is used for hardening high-speed steel cutting tools used on milling machines, turret lathes, engine lathes, screw machines, etc. The tools are first pre-heated slowly to about 1600-degrees F. in an adjacent furnace; then given the hardening heat treatment at around 2200-2300-degrees F. for from 1 to 10 minutes, depending on the unit being hardened. This calls for an unvarying, exact and predetermined temperature in each instance.

The complete system consists of—(1) the Furnace, with temperature changes in it transmitted from a platinum-rhodium thermo-couple to the (2) Pyrometric Instrument, a Micromax (Leeds & Northrup) recorder-controller unit, which is the same as those used for ON-OFF control except that it contains a special potentiometer, the movable contact of which moves over the potentiometer slide wire as the instrument operates to indicate temperature changes.

FIG. 3. Close up of Heald Grinder shown in foreground, Fig. 2. Note push button speed control station next to 1 H.P. Motor. Mot-O-Trol cabinet in rear.

The instrument is connected to (3) the Reactrol panel, so that a low voltage is applied to the potentiometer. The voltage appearing between the movable contact and one end of the potentiometer is fed into the amplifying tube on the Reactrol panel which, in turn, regulates the flow of direct current to the saturable-core reactor and the amount of power input to the furnace.

The Reactrol panel supplies direct current to saturated winding and increases the direct current when the potentiometer calls for more furnace power input, decreasing it when less power is needed. A change in furnace temperature causes a slight movement in the Micromax instrument, changing the voltage across the potentiometer. This voltage is fed into an amplifying tube on the panel. This amplified voltage controls the grid of a thyratron tube which rectifies alternating current and controls the resultant direct current to the (4) Saturable Core Reactor.

A third tube, a phanotron, is used to obtain full-wave rectification. This General Electric Saturable-Core Reactor acts as a valve to regulate the amount of electric power flowing to the furnace. It consists of a laminated iron core with three windings. The two A-C windings are connected in series with the furnace across the main power supply. The D-C winding is connected to the Reactrol panel. With no current in the D-C winding, the impedance of the A-C winding is high, and most of the power-supply voltage appears across the reactor; hence the power input to the furnace is at a minimum.

FIG. 4. Furnace, "T" used for tool hardening, is a G.E. 36 KW Globar unit kept at a predetermined, constant heat with a G.E. Reactrol System, an electronic control.

FIG. 5. Micromax recorder-controller pyrometer above Reactrol Panel showing straight, almost unwavering temperature line.

The reverse is true when maximum current flows in the D-C winding. Intermediate values of power input are obtained by varying the current in the D-C winding. In operation this varying is done by the Reactrol panel and the Micromax instrument. These instant and constant change of power input that compensates for the variations in the furnace load heat demand, maintains a temperature at the control point (the thermocouple) which varies so slightly that the temperature line on the Micromax chart is practically straight, with hardly a perceptible wave. In contrast, the comparable Micromax chart line produced by ON-OFF control has a very evident wave, with a variation of 20-25 degrees F. from high to low (See Fig. 5).

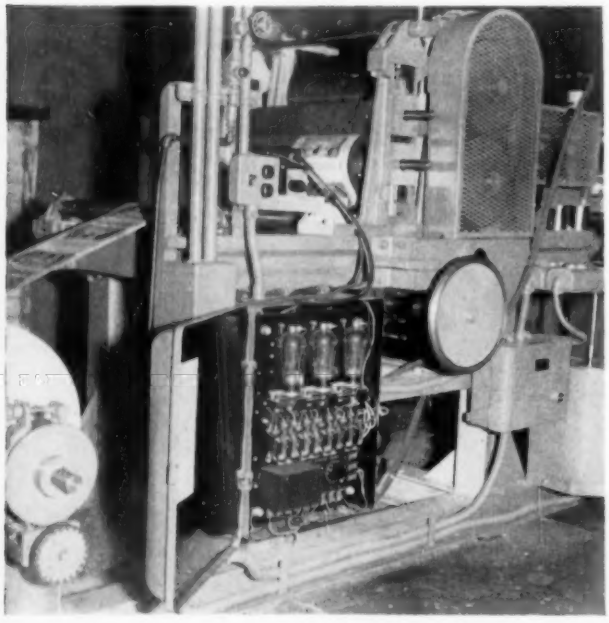
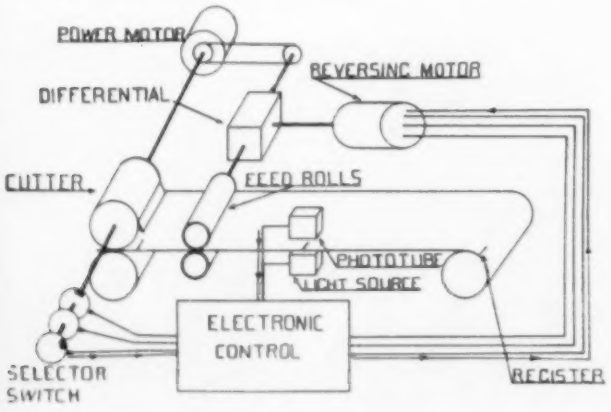


FIG. 6. **Electronically controlled paper slitting and scoring machine. Note Reactrol control panel in center. Sheets to be scored and slit are fed from large roll at left.**

Another type of electronic control is employed in a large paper converting plant. Modern packaging methods use a printed design on each wrapper or carton. From the standpoint of handling efficiency it is necessary to retain the paper in the form of a roll as long as possible, it being much less expensive than printing and coating the coverings in single sheets. After the bleached sulphide paper in large rolls has been run through rotary, color printing presses one pass for each color imprinted, it is coated by passage through a bath of molten paraffine, followed immediately by cooling in a water bath that congeals the coating.

FIG. 7. **Diagram of application of Regulator Electronic Control to cutting (and scoring) packaging sheets.**



After leaving the water, the long strip has the water drawn off before going back into a roll. Next comes the problem of cutting the web into separate sheets with the printing correctly centered. This can only be done by automatically positioning the web at all times. Errors due to mechanical play and wear of the machine, and to the differences of stretch of various papers under different conditions of humidity and temperature, make it impossible to predetermine the amount of error. It is, therefore, necessary to correct it when the deviation occurs, not before. The best, and absolutely accurate solution of this problem has come about by the use of electronic equipment.

The cutting and scoring of a typical packaging unit—as a butter carton—controlled by two electronic devices that have been made integral parts of the cutting and scoring machine. The speed of the feed rolls is controlled, as desired, by a Varitronic motor control (Electron Equipment Corp.), with the same type of operation previously described on the Heald grinders. It will start or stop the machine's motor instantly, through the pressure on the proper button, and the speed is regulated by the setting of the speed control dial, either when the machine is idle or operating. 250 to 300 slits and scorings can be accomplished per minute.

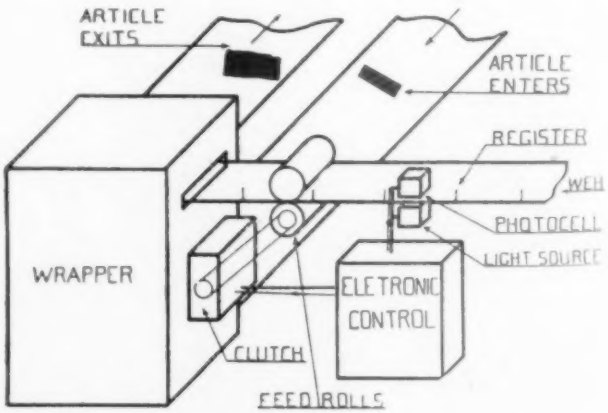
At the exact point where the slit is to be made, a register mark is imprinted. A Westinghouse Register Regulator, that operates from the register mark, can control the position of the web to a plus or minus $\frac{1}{32}$ of an inch, while it moves at a speed of even more than 1,000 feet per minute. Fig. 6 illustrates the main part of the register regulator.

As the paper travels from the roll to the rotary scoring cylinder and cutter, it passes beneath a phototube (electric eye), focussed at the edge carrying the register marks. As it scans each register mark, the reflection causes an impulse to be transmitted to the electronic control cabinet. This impulse tells where the paper is. On the other side of the machine there is a rotary selector switch, attached to the cutter, and impulses from it to the electronic control panel indicate where the paper should be.

Electronic controls compare the impulses from the two sources and, if they are not simultaneous, the speed of the feed roll is instantly advanced or retarded, by setting a differential mechanism in operation, to make the impulses properly synchronous.

Another electronic application controls the wrapping of various items (See Figs. 7 and 8). Wrapper regulators function when the registered mark passes beneath the electric eye. The resulting impulse releases the clutch on the feeder rolls and initiates a sequence of operations that allows the web to be cut and the product wrapped. As the packaged article leaves the machine, it trips a limit switch which starts the process for the next unit. This method of control insures the correct positioning of the wrapper.

FIG. 8. **Diagram of electronically controlled mapping mechanism.**



by **Nils H. Lou**

Tooling for Peace

"Photo-lofting," proven efficacious in cutting production time on vital war work, now a "tool" to cut costs in the consumer goods field.

While, to some degree, we may represent competing industries, all of us share the same interests and are faced with the same type of problems, in peace as well as in war. In the first place, we are proud to belong to a progressive Society of Tool Engineers. We are legitimate descendants of the master-craftsmen of the Middle Ages, who devised the tools for their trades and initiated journeymen and apprentices in the use of those tools.

By temperament, we are individualists. We work not simply to live, but also because our hearts are in the job. It is a safe guess that most of us here own a workshop of some kind at home, where we amuse ourselves after hours when our good wives would often prefer to have us join them in more sociable pastimes.

Nils H. Lou was born in Denmark, where he studied engineering at the Tekniske Skole, Copenhagen. Joining the Glenn L. Martin Company some years ago, he was progressively promoted to his present position of Assistant to the Vice President, Manufacturing Division. Mr. Lou is a member of Baltimore Chapter, A.S.T.E. of which he has been chairman several times. He has also served as a Director and as Chapter Industrial Relations Chairman.

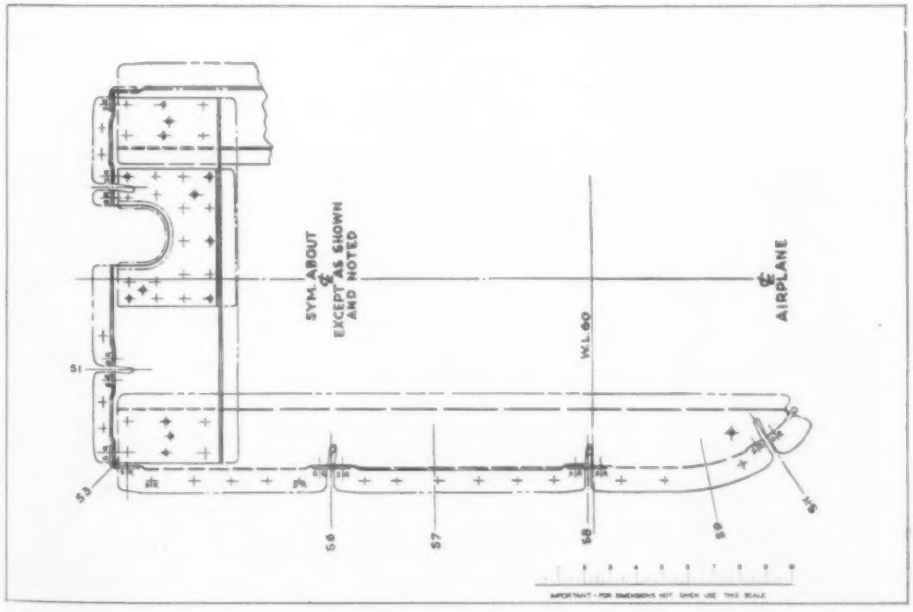
Throughout the last four years, it cannot be recalled that anyone ever had cause to be concerned about the morale of America's tool engineers. The tool engineers saw their responsibility clearly and they shouldered it without question. Even though there were times when it seemed impossible to accomplish all that was needed—with the shortages of materials and skilled help and especially with the limited time at their disposal—they met their commitments in full, translating the blueprints of army, navy and civilian planners into the tools of wartime production.

Inspection of template or blank by means of photo-reproduction.

Members of both the German and Japanese General Staffs have publicly confessed that the quantity, quality and variety of U. S. war materiel, particularly in the air, exceeded anything they ever anticipated. This country's ability to tool as rapidly and effectively as the situation demanded was an immeasurably important factor in its all-out industrial mobilization for war and in the final victory. It may be an equally decisive factor now that peace is here. . . .

In certain respects, the job of tooling for peace is even harder than tooling for war proved to be. Following the Pearl Harbor disaster, the entire country backed us in a wave of patriotic fervor. Though materials were short, money was no object. Time was everything! Normally competing firms freely shared patents and trade secrets with one another, today, however, all that is ending as industry reverts to its peacetime stride and peacetime methods of cost-accounting.

Moreover, today people everywhere are a little tired. They feel that they have done their share. They expect the fine fruits of peace to drop into their laps without exertion—as if new refrigerators, washing machines, radios, automobiles, airplanes or Nylon hose could make themselves. What they do not quite grasp is that much effort, initiative and even sacrifice are still required to insure the American way of life. . . .



Airplane Section, greatly reduced, for photo-lofting. Note clarity of reproduction.

The tool engineers of America have unquestionably earned a rest—many of us are suffering now from what has been termed "non-combat fatigue!"—but, the time has not yet come to relax. Until the factories, yards and plants, so recently geared for war, have re-tooled for peace, the war will not be fully over nor the rewards of victory assured. We tool engineers have one more big job to finish before business can operate freely, on normal lines, or adequate employment and purchasing power can be assured for millions of returning veterans. Again, time is of the essence.

According to press dispatches, the newspapers in Russia are following the employment situation in the United States with keen interest, even featuring it as front-page news. Possibly some people, who do not know the United States, doubt this country's ability to re-convert such a vast industrial network to peacetime production in an orderly manner. Just, for that matter, as others were formerly skeptical of its power to deliver sufficient weapons of war in time. We disappointed the skeptics once and we will do so again—in part—by making use of the new inventions, techniques and production short-cuts developed during the war."

The Glenn L. Martin Company has, for some years, devoted special attention to improving the processes and reducing the time required for tooling. This is only natural, since aircraft factories are particularly faced by tooling problems. Every new airplane demands a complete new set of tools—virtually nothing can be carried over from one model to the next.

Accuracy of Detail Important

At the same time, accuracy of detail is vitally important. Adherence to close tolerance may mean the difference between life and death in the air, between stability of a plane in flight and dangerous vibrations. Scale models for wind-tunnels, as well as mock-ups and experimental prototypes, on the basis of which contracts are awarded, call for a like degree of accuracy.

In the past, before a plane could be produced in quantity, many thousands of shop layouts- were required, for detail manufacturing alone, in addition to those required for the larger jigs, assembly fixtures and inspection lay-outs. Needless to say, this called for a number of highly trained tool makers and tool designers, as well as tool engineers.

Wartime expansion, together with the draft, however, forced us to employ large numbers of semi-skilled and hastily trained hands, not only in tool manufacturing but throughout the plant as a whole. While skills were spread thinner, the need for speed and volume of production soared. It became necessary to simplify and specialize individual operations.

To accomplish this would have required an overwhelming number of shop lay-outs for which time and skills were lacking. So, obviously, some method had to be developed to reduce to a minimum the high-skilled manpower requirements on tooling. One of the most interesting processes or methods, that virtually eliminated the need for shop lay-outs, was developed by several Glenn L. Martin Company employees during the early stages of the war.

The method referred to is known as "photo lofting." By this means, shop lay-outs from engineering drawings are substantially eliminated. A single set of pencilled lay-outs, which may be reproduced by a photographic process, eliminates the need for tool makers and other shop men to duplicate lay-outs from drawings.

Process Dramatic

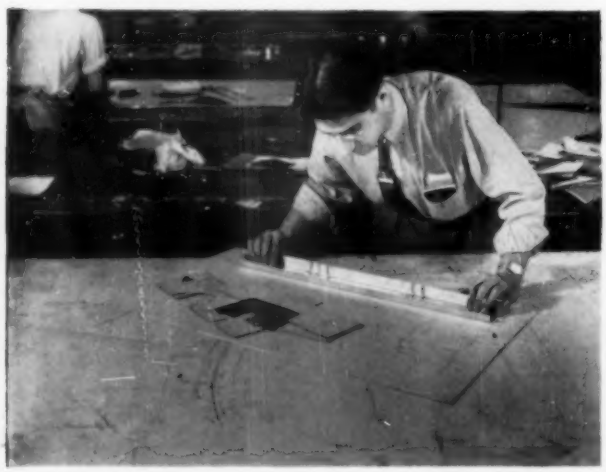
The full scale contour lines are drawn by master-linesmen on white-painted sheet metal, indicating the precise outline of airfoil, wing fuselage and tail sections at various convenient stations, with all details filled in. The full scale lay-outs are then photographed on ordinary glass negatives, which are later developed. The same camera that was used for photographing the full scale lay-out, is later used for the reproduction. In this manner, the exact image of the original full scale lay-out is projected on sensitized sheet metal, or other tool materials.

Although the writer is no expert in the finer points of photography, the process is dramatic enough to merit some description and can be readily understood by a layman. A camera and supporting structure weighing about ten tons in all—perhaps the largest camera in the world—is built into the wall separating two rooms, each about 30 by 30 feet. The lens of the camera extends into one room, where the material to be copied is placed, while the other room serves as a huge camera box. In spite of its great size, the entire equipment operates as simply as an ordinary box-camera and is virtually foolproof.

"Blow-up" To Scale

The master lay-out is accurately placed in relation to the camera, being held against a flat, grooved copyboard by means of suction. Light travelling in front of it automatically assures a uniform exposure. Because full scale negatives would be unweildy for filing, smaller-sized glass plates are used. After the negative has been developed, it is replaced in the camera and the image is projected back upon sensitized sheet metal which has been laid against the copyboard in place of the original master lay-out. Photographs may be made up to five by ten feet, the photographs constituting an enlargement of the negative.

Inspection of formed part by means of photo-reproduction.



Sawing wood form block to outlines photographed on wood block.

Drawings which exceed the size of the copyboard are projected, section by section, on separate metal plates which are spliced together. In this way, for example, it was possible to reproduce entire bulkheads of the Martin Mars, for use in assembly work and inspection. Mass production of very large aircraft, like the Mars and the B-29 Superfortress, was made practicable by the use of the photographic reproduction.

Various Materials Used

The template material varies according to the shop use for which it is intended. Aluminum sheet, galvanized iron or steel are the materials most commonly employed. Contours which are reproduced on lacquer-coated steel or galvanized sheet, for example, can be used either as mark templates or for scribing the outline of a blanking die. The template is later used when filing the blanking die in the usual manner by fitting the die to the template, or making simple form dies, two other templates are made from the loft layout—one to the outside of the metal and one to the inside of the metal. The one to the outside is used for cutting the form die, the one to the inside, for machining the punch.

Construction of assembly fixture by mounting locators and clamps directly on photographed layout.

Reproductions are also made on heavy gauge steel sheet or on masonite, to be used in the construction of assembly fixtures. Locating blocks and clamps are placed directly on the surfaces, which, of course, have a complete outline of each detail part required for making the assembly.

For constructing patterns and forging dies, a photographic reproduction is made which allows for the necessary shrinkage, eliminating completely the use of shrink rules.

The advantage of photo-lofting is readily apparent in cases where only one or two models of an airplane, ship's hull or automobile body are being built. The engineering layouts can be photographed directly on the construction material, which is then cut as indicated—thus doing away with the need for laying out each part in the shop. The process is of particular value where a reduced scale model has to be made since, by merely adjusting the camera, the original full scale layout can be accurately reproduced to any specific smaller size. Small-scale layouts, reproduced on paper or transparent vellum, also prove useful reference guides in engineering.

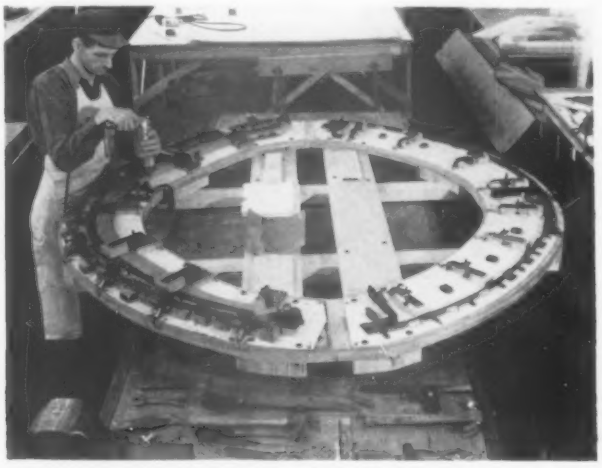
Eliminates Routine and Repetition

It is clear that the photo-lofting process frees the toolmaker from much tedious routine and repetition of effort, allowing him to concentrate on phases of the work which call for real ingenuity. Besides eliminating the necessity for shop layout, checking and transfer of lines, it facilitates inspection and reduces the margin of human error all around.

In aircraft production, it can be stated that this process has cut the time required for tooling as much as 100,000 hours on a medium size airplane such as the B-26, and will do the same on our peacetime Model 202. It is quite certain that the experience of other companies that are using it today—companies like Boeing, Grumman or Chrysler—has been the same. The process is not applicable to aircraft alone, but may be used with equal success, and time-saving, in all types of tool and sheet metal work. It has already been applied to ship-building, to automobile manufacture, to the construction of modern railway cars and locomotives—and this is only the beginning.

Sensational, and Broadly Applicable

No doubt there have been other short cuts and time saving processes developed in many industries, as a result of the war. But as far as the writer knows, this is the only one which is so broadly applicable to tool engineering as a whole, and so sensational in its results. The initial cost, of the equipment itself, is very quickly absorbed by the resulting economy of time as well as by the improved quality of the product itself due to greater uniformity achieved in tooling. Simple and inexpensive to operate, it assures a uniformly high quality of reproduction. It can be used whenever desired, for many other kinds of photo-reproduction work on metal, cloth or paper—for making nameplates and instrument panels, for example, as well as all sorts of display material, service manuals and instruction books.



Another example of construction of assembly fixture by mounting locators and clamps directly on photographed layout.

"Cooperation" Suggested

The writer believes, that this process could be profitably introduced into any large company manufacturing sheet metal products, and into many of medium size. Wherever a manufacturer does not wish to bear the entire cost, he can probably arrange to share the use of the equipment with other companies in his vicinity.

In fact, it might be a patriotic service for him to do so at the present time. From the few illustrations given, it is obvious that photo-lofting materially reduces the time between release of design and completion of tools—a consideration of vital importance today in reducing the gap between wartime and peacetime production and in providing both goods and full employment for the American people at the earliest possible date.

By Anders Jansson

Die Sinking with Tracer Control

Universal Duplicators quickly convert standard machine tools to automatic profiling.

THE VERSATILITY and broad application of tracer controlled profiling having been adequately proven during intensive war production, this technique—to use that term—will prove equally valuable in the manufacture of intricate tools for the consumer goods market. For that matter, tracer controlled machining is equally efficacious on production work where close duplication is required.

Among urgent tooling problems of the present are the manufacture of punches and dies, die casting dies, plastic molds and cavities, rubber and glass molds and other similar tools and products. This work can all be done automatically on standard milling machines, lathes, turret machines, boring mills and shapers by means of automatic duplicators.

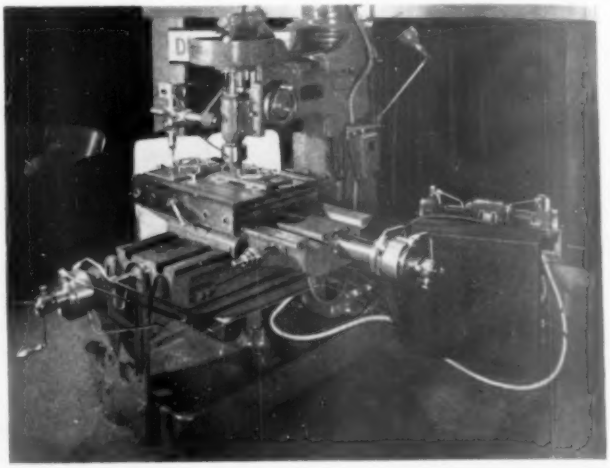
While several such tracer control units are on the market,* and all showing excellent performance, material for this article has been drawn from the Duplimatic files of Detroit Universal Duplicator Co., Detroit. A few typical installations are shown, out of many; these, with examples of a wide variety of work, are indicative of the flexibility and range of these units.

Fig. 1 is an excellent example of the method of installation. A hydraulic motor is mounted on the longitudinal lead screw and another is mounted on the cross feed screw. These serve as driving units when the machine is used for profiling or contouring. They are controlled by the electric tracer mounted off the head of the mill. Hydraulic motors can be attached to any one, two or three feeds of any machine tool in a similar fashion.

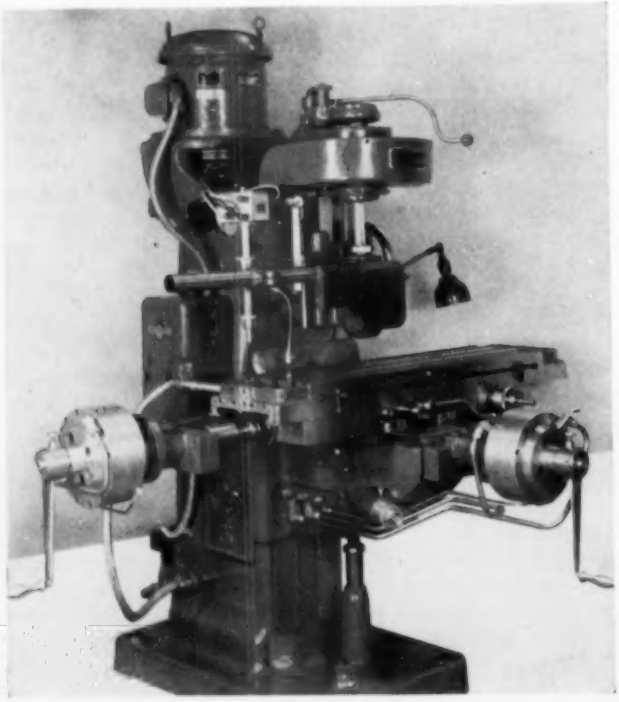
Fig. 2 shows an example of the type of work that can be machined with these controls attached to a Reed-Prentice vertical milling machine. The double cavity of the workpiece is machined automatically as the tracer follows over the wooden model, with the vertical travel driven by a new twin-head hydraulic drive unit embodying a differential gear principle. (This drive was developed for driving rack and pinion machine tool feeds.) A second hydraulic motor drives the longitudinal table feed.

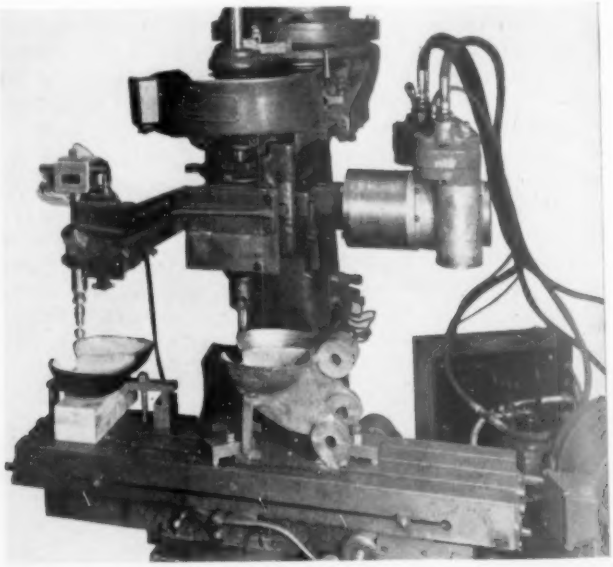
These two feed controls—the vertical and the longitudinal—are coordinated by the tracer and operate simultaneously at a continuously varying rate to reproduce the cavity in the model. A third hydraulic motor is attached to the cross

* *The reader is referred to Tracer Controlled Milling, Andrew E. Rylander in June '45 THE TOOL ENGINEER.*



Detroit Universal Duplicator as displayed at the A.S.T.E. Tool Show, Milwaukee. Newer developments will be shown at the coming A.S.T.E. New Era Exposition, to be held in April at Cleveland.





1. Vertical milling machine indicating method of mounting double duplicating controls.

2. Machining cavities on vertical mill controlled by duplicator.

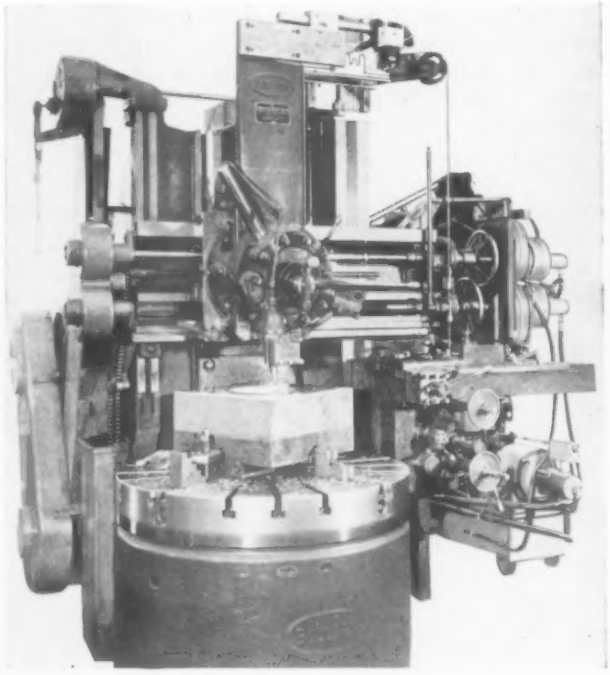
table feed. The purpose of this cross feed control is to index the table over any desired amount at the end of each pass over the die. The operation is then completely automatic, as this cross feed hydraulic motor is controlled by an electronic timer.

Adjustable limit switches are fastened to the table so that, after each passes over the die, the cross feed is indexed the desired amount and the direction of feed reversed, when a cut over the die in the other direction begins. This feeding and indexing continues until the piece is completely machined without any attention on the part of the operator being necessary. This control unit is a Double Duplimatic with electronic indexing.

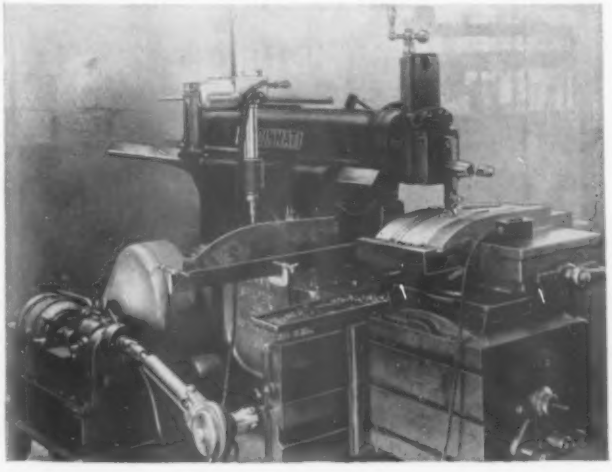
Fig. 3 shows a Double Duplimatic attached to a Bullard vertical turret lathe machining a forging die with a single tool. The template is shown in the upper right hand corner of the picture and is attached to the top of the machine column. The tracer is mounted on the ram. Two hydraulic drive units are installed on the right hand end of the rail to drive the head vertically and cross. This picture shows clearly how these controls, when applied to a machine tool, do not require the removal of any essential part of the machine. As soon as the control unit is turned off the hydraulic motors declutch from the feed screws automatically and the Bullard can be operated either manually or under its own power feed just as though the controls were not attached.

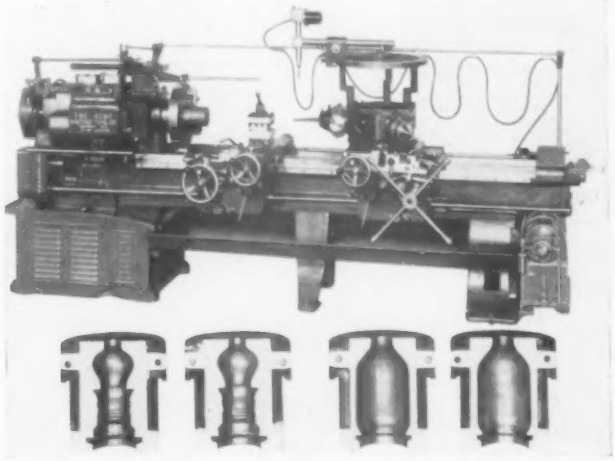
Many roughing and finishing operations on dies can best be handled with duplicating controls attached to a shaper, as in Fig. 4. This does not require a full size model—only a sheet metal template—as neither the template nor the tracer move with the ram. A Single Duplimatic is coupled, through a bevel gear drive arm, to the table elevating screw. The template is fastened to the table and the tracer is stationary. The operation is this:- after each stroke of the ram, the table is indexed by its standard controls and the duplicating controls raise or lower the table automatically to machine the desired curve. This sequence of stroke, index, and table control continues without interruption or operator help until the die is finished. This particular job is a die cast die.

Bottle molds, of shapes shown in Fig. 5, are machined automatically with duplicating controls attached to the cross and longitudinal feed rods of the turret of this Acme turret

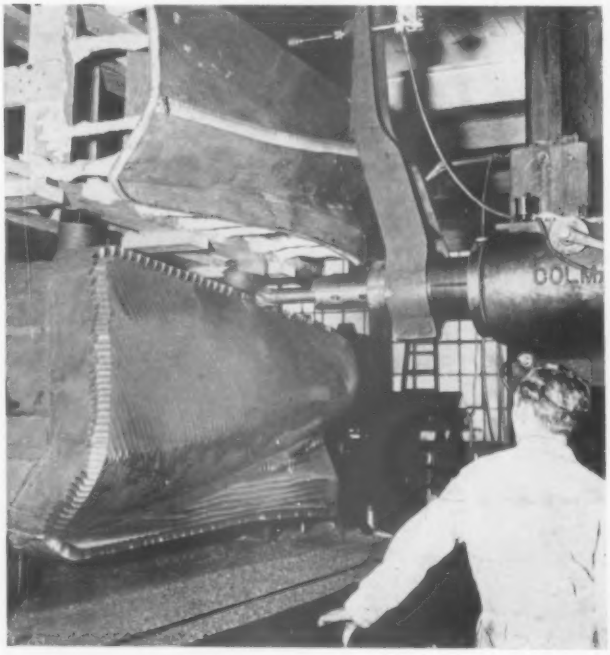


3. Machining forging die with duplicating controls attached to vertical turret lathe.
4. Shaping contour of die cast die.





5. Contouring bottle moulds with double duplicating controls attached to turret lathe.
6. Duplicating controls attached to horizontal boring mill for automotive die work.



lathe. There are several operations on the bottle mold in this set-up, both with the cross slide and cross sliding turret. These are carried on by the operator with the standard machine controls and, when the time comes for the duplicating operation, the turret is brought into position and the duplicating controls reproduce the template contour onto the workpiece automatically as the tracer follows the template. When this contouring operation is finished, the duplicating controls are turned off and the operator continues his work without being impeded in any way by the Duplicator.

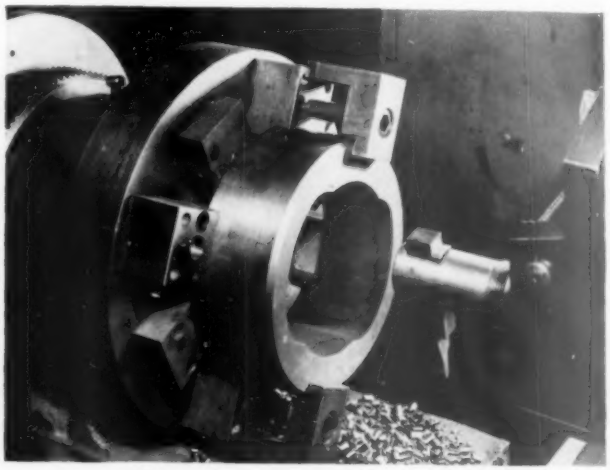
Large automotive dies are contoured and profiled with duplicating controls attached to horizontal boring mills, as in Fig. 6. The model is mounted on the table of the boring mill, above the die, and the tracer is mounted on a quill bracket extending up to the die. One hydraulic motor drives the head vertically and a second hydraulic motor drives the table in a direction perpendicular to the spindle. The tracer coordinates these two feeds to pass over the die. At the end of each pass, the cross table feed is indexed by a third hydraulic motor, as mentioned above in the description of Fig. 2. This feeding over the die and indexing continues automatically until the die is completely machined.

Duplicating with a rotary motion often solves intricate pattern and tooling problems. In the vertical milling machine installation, shown in Fig. 7, a double Duplimatic controls the rotary table and the longitudinal table feed. The tracer follows a developed template that is also mounted on the rotary table. The development of a template of this type is particularly interesting because, instead of costly layout and hand work, the identical setup shown in Fig. 7 is used to make the template, except that a finished piece is placed on the rotary table instead of a forging.

The rotary table is moved axially along the mill table until this finished piece contacts the tracer. The machine is then started and, as the tracer follows around the finished piece, the cutter machines a blanked-out template to the exact shape and size desired. The rotary table is then moved axially back to where it shows in the picture. A forging is clamped in position and the tracer follows around the newly cut template to reproduce the desired shape onto the forging.

Another specific example of applying duplicating controls to rotary motions is the shaping of ring type cam paths. The setup is shown in Fig. 8, with the finish machined ring in Fig. 9. A single Duplimatic controls the table elevating screw of a shaper, with the rotation of the workpiece and template obtained from the standard indexing mechanism. After each stroke of the ram, the workpiece and template are indexed and the duplicator raises or lowers the table to reproduce the shape of the template onto the ring. The sequence continues automatically until the ring is finished. The machining of this particular ring took 32 minutes and, on this particular job, no operator was assigned. Every half-hour an employee came over from an assembly bench to unload the finished piece and reload. As an amusing and rather informal sidelight, an alarm clock was used to signal the half-hour time interval.

7. Duplicating metal patterns with rotary table control.
8. Shaping ring cams with the aid of single duplicator.



9. Closeup of ring cam finish shaped.
10. Triple Duplimatic on Sellers horizontal boring mill.

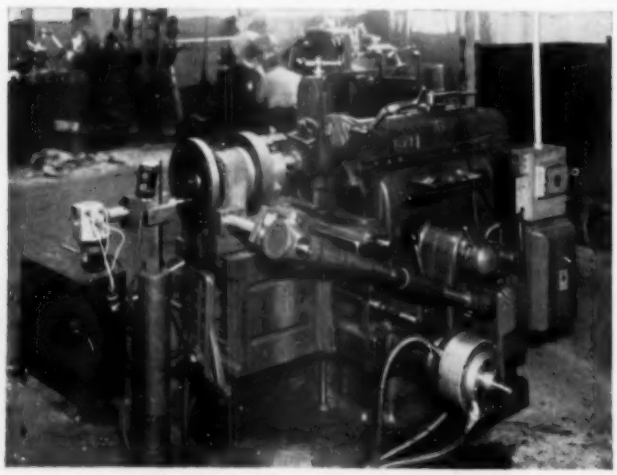


Fig. 10 shows a triple Duplimatic installed on a Sellers horizontal boring mill. Here, one hydraulic unit drives the platen, another the table while a third controls the up and down movement of the head. The flexibility of these duplicating controls is demonstrated by the fact that all of the machine tools pictured in this article can be controlled by the same Duplicator. All that is necessary is to move the hydraulic motors and the tracer from one machine to another and to move the hydraulic power unit, which is on wheels, to a convenient position.

Below, schematic diagram of the Duplicatic, manufactured by Detroit Universal Duplicator Company, Detroit. The cutaway shows the essential parts of the Duplimatic, how it operates and why it can produce with consistent accuracy at high speed.

At the extreme lower right is the drive head assembly. This consists of a sleeve for connecting with the feed screw of the machine tool, reduction gearing and fluid motor, the latter connected to the tank by means of high pressure hydraulic hose. The hand crank is for gear selection and manual control, when setting up.

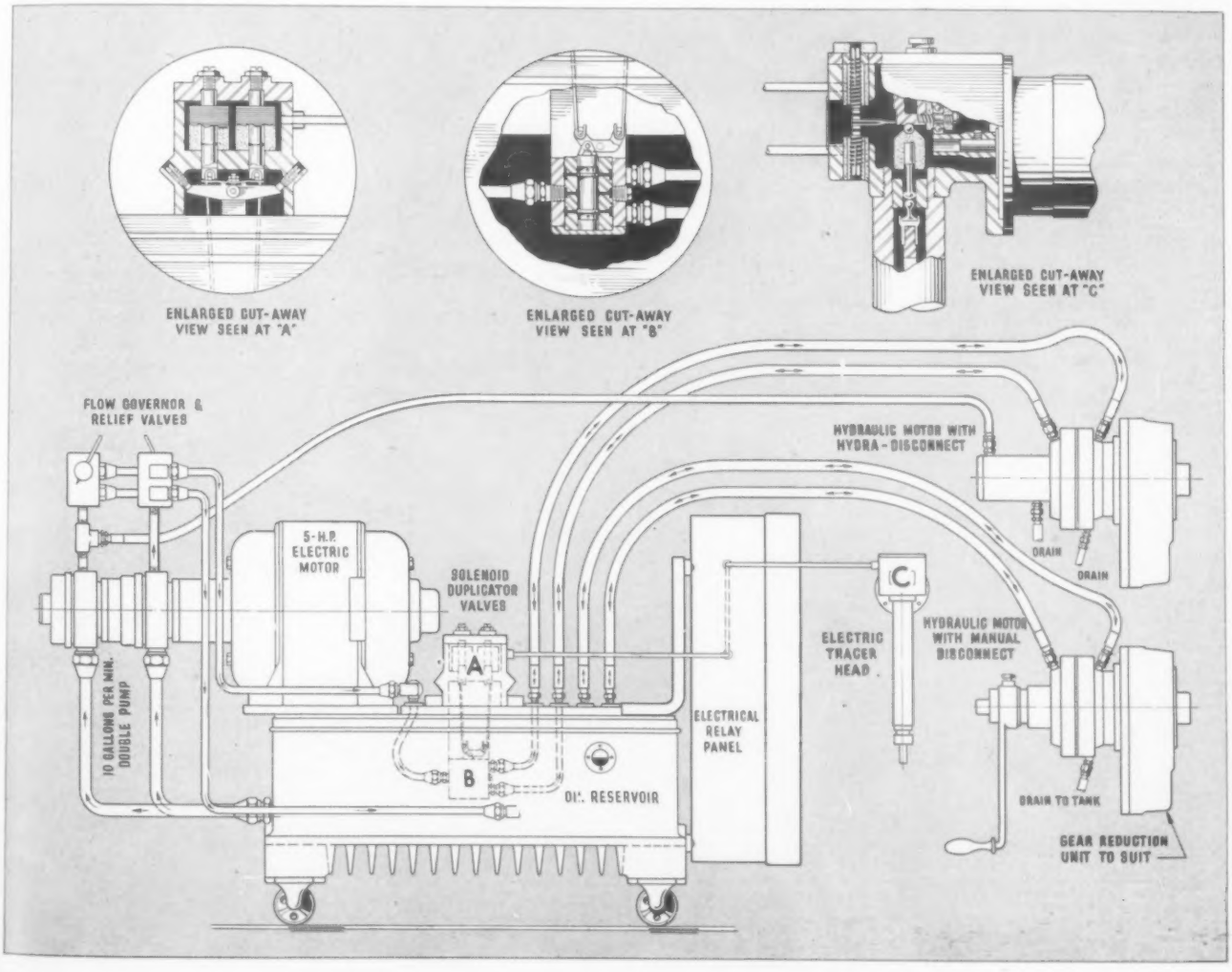
The valve (B) in the base of the machine (shown in detail above) meters the oil supply from the pump to either hose, depending on the position of the piston. Precision solenoids (detail A), mounted on top of the tank, govern piston position. Each solenoid is connected with a contact point in the tracer head, so that when the center contacts in the tracer arm (Detail C) are moved up, contact with the upper point energizes the left-hand solenoid. Lowering the arm actuates the right-hand solenoid.

The ball pivot, mounted on the upper end of the tracer shaft, must hold this center arm at neutral to prevent contact. A lapped hole, at the lower end, holds the stylus. When, however, any movement is made and contact is established, it is only instantaneous since the cam on the shaft of the fractional HP motor keeps the center arm in constant high frequency vibration. The unique "collar-button" arrangement in the tracer shaft resolves any horizontal movement at the stylus into vertical motion, which, incidentally, is transmitted directly.

Sequence of operations follows: The tracer shaft is lowered; instantly, the ball bearing pivot point permits the vibrating center arm to be lowered. This, through momentary electrical connection with lower contact point, energizes the right-hand solenoid. The rod is lifted, the piston pivot arm is lifted and the piston is *lowered*, permitting oil to flow into the lower hose. The fluid motor in the drive head is rotated, with rotation reduced and transmitted to the feed screw. Meanwhile, the upper hose acts as a return, while a spring, extending under both solenoid plungers, returns the piston to neutral as soon as contact is broken.

With the valve at "neutral" the flow of oil is equalized between two lines, which may then actuate the motor in either direction with the overflow returning to the tank. To illustrate the fine division of each increment, and the extreme accuracy of the unit, electrical contact of the tracer head is broken 1800 times per minute with but a drop of oil metered through the valve for each contact and with the almost imperceptible movement of the fluid motor reduced as much as 36 to 1 in the gearing.

When two or more feed screws are to be turned, a second or third head (as left center) may be connected up and operated in the same manner. However, the tracer remains substantially the same. There is nothing particularly complicated either in equipment or operation, rather the whole embodies proven principles of design and parts that are considered standard and entirely dependable.



By Burton R. Garrett

The Use of the Diamond Pin in Locating Work

Accuracy of location is enhanced by the elimination of dimensional variations.

THE PROBLEM of accurate location is one that is frequently encountered in the design of jigs and fixtures, and especially in the design of gages for precision parts. The major problem in accurate location of the work piece on a drill jig, milling fixture or gage is that of eliminating the effect of dimensional variations due to tolerances of location and size permitted in previous operations. Another consideration affecting the accuracy of location is the tolerance of the fixture or gage on which the part is to be mounted.

Burton R. Garrett **was graduated from Cooper Union Night School of Engineering with degree B.S. in M.E. Rounding out experience with various concerns, and as Chief Tool Designer with Simmonds Aerocessories, L.I. City, he organized the U. S. Engineering Co., with offices at 140 Nassau St., New York City.**

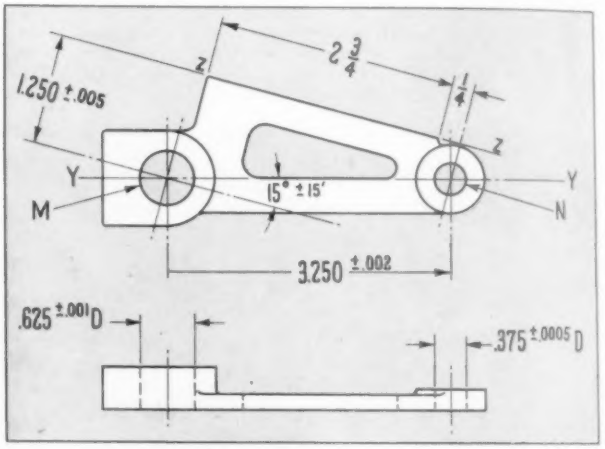
There are many methods that might be used, as spring-loaded taper pins to compensate for variations in the hole diameter of the part, or of sliding members to compensate for variations in center distance. These mechanisms, however, require very accurate tool room work if they are properly to perform the intended functions and therefore greatly increase the cost of the tool or gage. They often have the disadvantage of tending to bind, or of being clumsy to operate.

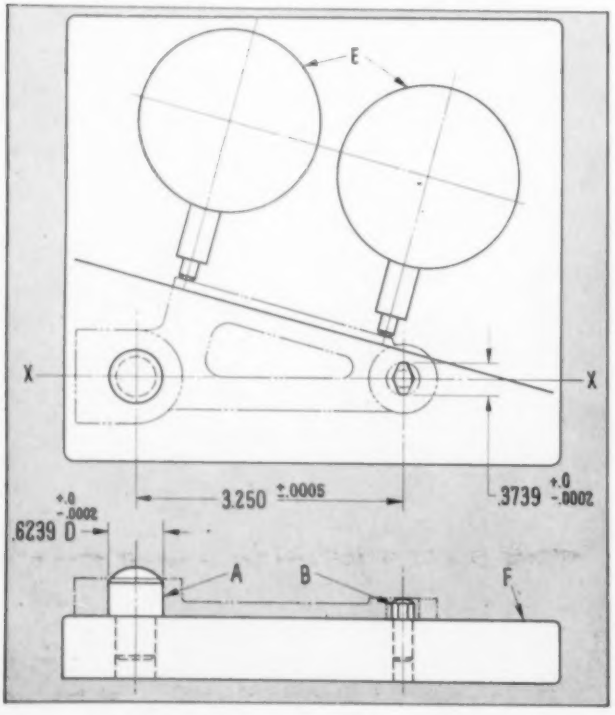
Where a small loss of tolerance is permissible, the "diamond pin" offers the advantage of simplicity and low cost. It is the purpose of this article to determine under what conditions it is practical to use the "diamond pin" as a means of location and to discuss its advantages and limitations.

The "diamond pin" is a means of location that is in very common usage among tool designers. But it is often used without fully analyzing its relation to the part it is used to locate. The result is that the tool either does not give the desired accuracy, or has to be reworked when it gets into the shop in order to function at all.

Application of Use of "Diamond Pin"

As a means of demonstrating the function and limitations of the "diamond pin" as a means of location, let us take the gage illustrated in figure 1. The purpose of this gage is to





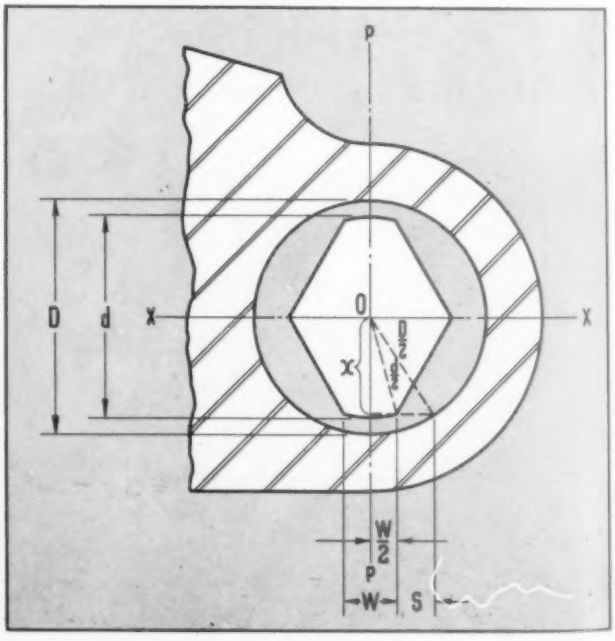


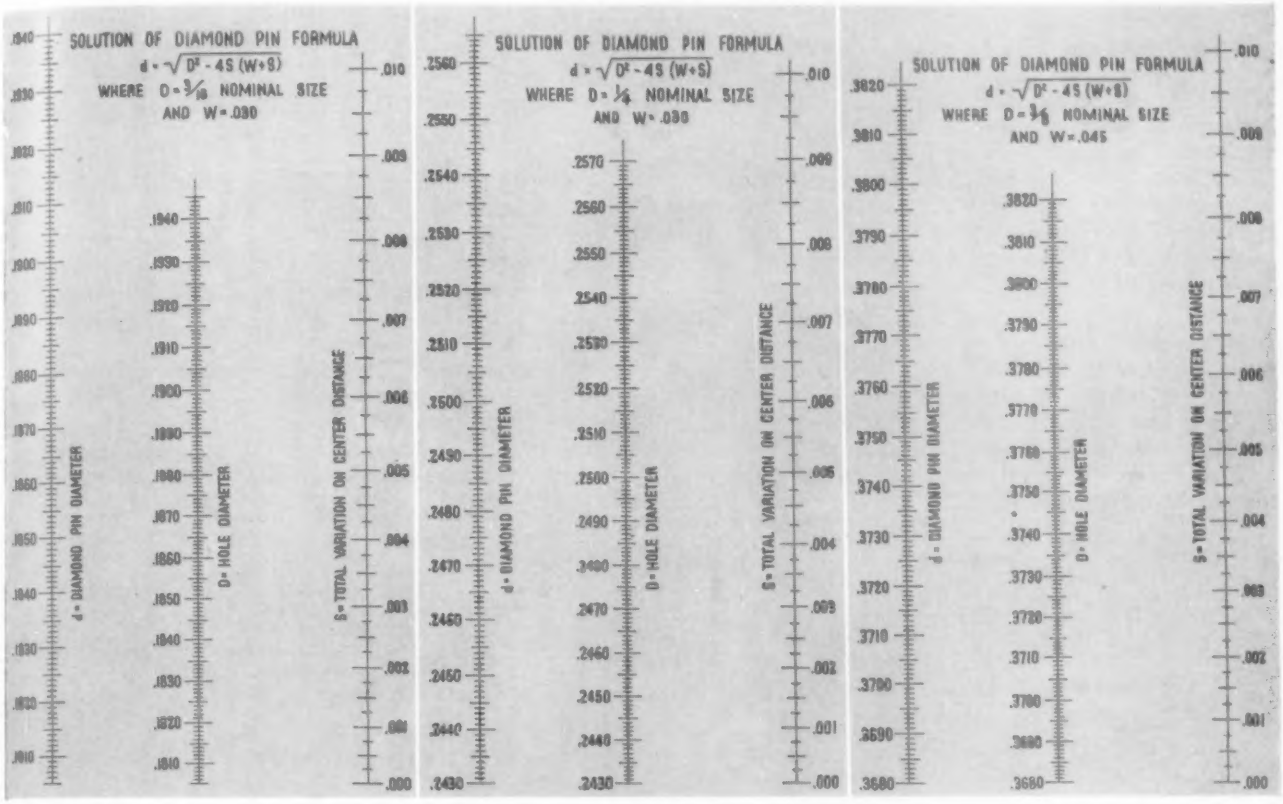
FIG. 1. Left. *FIG. 2.* Above. *FIG. 3.* Below.

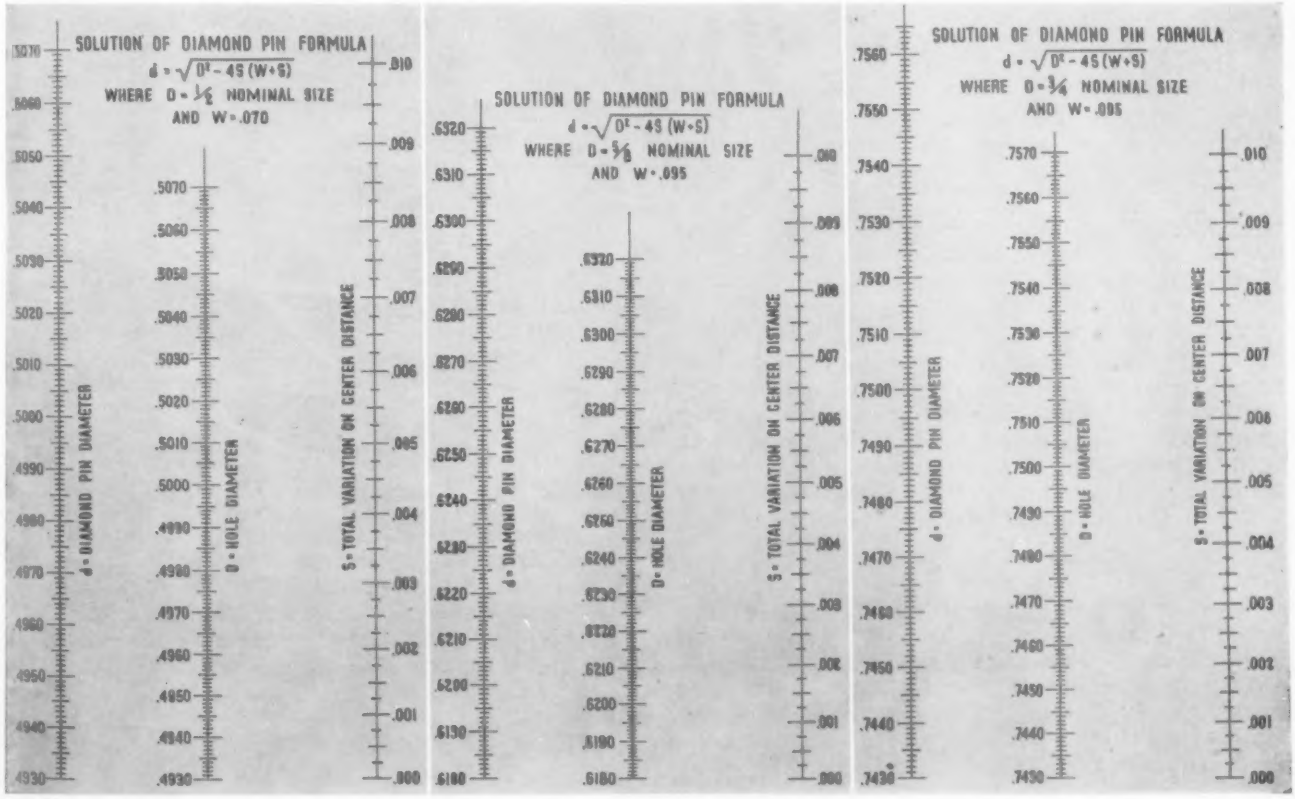
check surface Z-Z of the Cam, figure 2. This surface makes an angle of 15° with center line Y-Y and is 1.250 ± .005 from hole M. These values are checked by the reading on the dial indicators "E" which are set by a master which is not shown. The cam is located on the round pin, A, and the "diamond pin", B, so that axis Y-Y of the cam lies on axis X-X of the gage.

The accuracy of the gage depends largely on how nearly axis Y-Y of the Cam, fig. 2, can be made to coincide with the axis X-X of the gage, fig. 1.

There are three prime factors governing the accurate location of the cam on the gage. They are as follows:

1. The tolerance on the diameters of the two locating holes M and N, fig. 2.


SOLUTION OF DIAMOND PIN FORMULA
$d = \sqrt{D^2 - 4S(W+S)}$
WHERE D = 3/16 NOMINAL SIZE
AND W = .030
SOLUTION OF DIAMOND PIN FORMULA
$d = \sqrt{D^2 - 4S(W+S)}$
WHERE D = 1/4 NOMINAL SIZE
AND W = .030
SOLUTION OF DIAMOND PIN FORMULA
$d = \sqrt{D^2 - 4S(W+S)}$
WHERE D = 3/8 NOMINAL SIZE
AND W = .045
d = DIAMOND PIN DIAMETER
D = HOLE DIAMETER
S = TOTAL VARIATION ON CENTER DISTANCE


SOLUTION OF DIAMOND PIN FORMULA
$d = \sqrt{D^2 - 4S(W+S)}$
WHERE D = 1/2 NOMINAL SIZE
AND W = .070
SOLUTION OF DIAMOND PIN FORMULA
$d = \sqrt{D^2 - 4S(W+S)}$
WHERE D = 5/8 NOMINAL SIZE
AND W = .095
SOLUTION OF DIAMOND PIN FORMULA
$d = \sqrt{D^2 - 4S(W+S)}$
WHERE D = 3/4 NOMINAL SIZE
AND W = .095
d = DIAMOND PIN DIAMETER
D = HOLE DIAMETER
S = TOTAL VARIATION ON CENTER DISTANCE

2. The tolerance on the center distance of holes M and N.
3. Similar tolerances on the mating parts in the gage, fig. 1.

In the type of gage illustrated, the diameters of the pins A and B are based on the minimum hole dimensions of M and N, resulting in a certain amount of play between the gage and the part being gaged. The variation due to the tolerances on the center distances between holes M and N on the cam and A and B on the gage, is largely compensated for by the use of the diamond pin.

In order that axis Y-Y of the cam, fig. 2, should coincide with axis X-X of the gage, fig. 1, the "diamond pin" must compensate for the sum of the tolerance on the center distance on the holes in the cam, ±.002, and that of the pins on the gage ±.0005.

In other words, the gage must permit hole N on the cam to vary along axis X-X a distance of .0025 either side of "diamond pin" B while limiting its motion to a minimum in a direction perpendicular to axis X-X.

Derivation of Formula

Figure 3 shows an enlarged view of the "diamond pin." It is seen that the shape of the diamond pin permits a relatively large motion "S" along axis X-X as compared to its motion perpendicular to this axis.

Let us now determine the diameter of the "diamond pin" required to permit the necessary variation "S."

From the construction shown in Fig. 3, we have two right triangles having a common side X. Then:

$$X^2 = \left(\frac{d}{2}\right)^2 - \left(\frac{W}{2}\right)^2 = \left(\frac{D}{2}\right)^2 - \left(\frac{W}{2} + S\right)^2$$

$$\frac{d^2}{4} - \frac{W^2}{4} = \frac{D^2}{4} - \frac{W^2}{4} - \frac{2WS}{2} - S^2$$

$$d^2 = D^2 - 4WS - 4S^2$$

$$d = \sqrt{D^2 - 4WS - 4S^2} \qquad (1)$$

where:
D = minimum diameter of hole in work part
d = maximum dia. of "diamond pin"
W = maximum chord of "diamond pin"
S = total permissible variation between "diamond pin" and hole along axis X-X.

From an examination of fig. 3, the following becomes evident: For given values of D and d, S becomes smaller as W increases, so that when W becomes equal to d, $S = \frac{D-d}{2}$, i.e. the 'diamond pin" becomes a round pin. Therefore, to obtain the minimum clearance between the "diamond pin" and the hole, or minimum movement along axis P-P, W should be as small as is consistant with long life of the pin.

To facilitate its use the "diamond pin" equation (1) has been resolved into a series of alignment charts which are reproduced on the preceding pages. In order to simplify these charts and to put them into a practical scale, each chart is plotted for a small range of the hole diameter D, and W is made constant for that range. This does not limit the use of the charts however, since for a given value of S, D—d can be interpolated between successive charts. Corresponding values for D and W are given in table 1.

Errors Due to Tolerances

In the problem under consideration the maximum variation "S" to be provided for equals .0025. The minimum size of hole N equals .3745 which is equal to D in equation (1). The solution of equation (1) for a ⅜ nominal hole is found on charts 3. By drawing a straight line through the above values of S and D on this chart we find that it intersects the d scale at the value d = .3739.

Since the diameters of the two pins A and B of the gage, fig. 1, are based on the minimum diameters of the holes M and N, fig. 2, and since it is possible for the actual size of these holes to vary from the minimum values to the maximum values, certain errors are introduced into the gage. The tolerances on the gage pins also add to this error.

Thus we have a possible difference in diameters between hole M and pin A of .626 — .6237 = .0023. The maximum clearance between hole N and "diamond pin" B is likewise .3755 — .3737 = .0018. Axis Y-Y of the cam may shift half the minimum clearance or .0009 parallel to axis X-X. A point on Y-Y near hole M may move from axis X-X a distance equal to $\frac{.0023}{2} = .0011$. This affects the accuracy to which the 1.250 ±.005 dimension can be gaged. Since the gage must not accept work outside the limits indicated, this lost motion of ±.001 (max. value at Z) must be absorbed in the gaging limits. Thus the dial indicator gage E cannot show a variation of more than ± .004 after being set with the master.

In checking the angular dimension of 20° ± 0°15′, the center distance 3.250 ± .002 enters as a factor in determining the possible error. The possible angular deviation of axis Y-Y from axis X-X is equal to the angle whose tangent is equal to one half the sum of the clearance between pins A and B and holes M and N, divided by the center distance. Thus the angular variation =

$$\tan^{-1} \frac{\frac{.0023}{2} + \frac{.0018}{2}}{3.250} = \tan^{-1} \frac{.002}{3.250} = \tan^{-1} .00061 = 0°2'$$

Similarly, this variation must be absorbed by the working tolerance of ± 0°15′ so that the maximum and minimum readings of the dial indicators must be based on an angular tolerance of ± 0°13′. These compensations are in addition to those due to the gage maker's tolerances on the gage master.

If, after analyzing the errors introduced by the above factors it is found that they are so great as to make the gage or fixture unsatisfactory, then the other methods of location must be used.

More exact locating means are easily designed, but they are usually more expensive to make and are often cumbersome to operate.

Summary

In conclusion, we may summarize the advantages of the "diamond pin" as follows:

1. Its use simplifies gage and fixture design.
2. The tool making cost is low.
3. It lends itself toward ease and speed of operation.
4. There are no moving parts to bind or get out of order.
5. For most applications it provides sufficient accuracy.
6. With the accompanying charts, pin diameters are convenient to calculate.

New "Tufanhard" Electrode

A new heavy coated hard surfacing electrode that welds like mild steel and "wears like a diamond" has been developed by the Hobart Brothers Company, Troy, Ohio.

This new electrode, designated as "Tufanhard" is made in three grades, "600," "400," and "250" which corresponds with the Brinnel hardness of deposited metal, and will operate on either A.C. or D.C. with straight polarity recommended when using D.C. machines. Electrodes are made in 14" lengths, in ⅛", $\frac{5}{32}$", $\frac{3}{16}$" and ¼" sizes and packed in 5 lb. and 25 lb. cartons.

By W. C. E. Prins

Industrial Engineering as Related to Industry

Devised formulas and set procedures simplify thinking and reduce the time required for involved calculations and repetitive problems.

BY DEFINITION, engineering is the profession which applies proven scientific principles to the solution of practical problems. The process of obtaining pertinent facts, weighing of these facts by their relative bearing on the problem and applying established, fundamental natural laws to the solution involves the use of arduously developed techniques.

To simplify thinking, and to reduce the time of involved calculations, repetitive and similar problems are clericalized by the use of devised formulas and set procedures. Routine solutions of formalized problems are thus handled by administrative means rather than by engineering. Solutions obtained in this manner are susceptible of egregious deviation from scientific truth; they must be further checked by engineers to make sure that the formulas applied, or procedures used, are realistic to the specific problem. Arbitrary adherence to formulas and procedures, without regard to their pertinency, is a too prevalent administrative custom leading to many errors of execution.

Winston C. E. Prins was graduated from the U. S. Naval Academy, Annapolis, and saw service at sea and in Nicaragua. After engineering connections with Western Electric and other corporations, he launched into industrial engineering. At the outbreak of war he rejoined the Navy as a consultant with the Bureau of Ships, but has since re-entered the Industrial Consulting field. He is a member of Detroit Chapter, A.S.T.E.

Sometimes, the executive direction of technical work falls upon engineers as an added task in addition to their job of engineering. It is frequently difficult to impart to administrators or executives the details of an engineering project. Pilot test runs of a production set-up, or initial trials of a procedure, usually require close supervision or counsel by an engineer in "ironing out the wrinkles." Occasionally, the executive talent is not available, or not heavy enough, to properly handle a project. Then, the engineer must take over and actively direct workers in the follow-through to consummation of his solution.

The foregoing restrictive description—or definition—of what is meant by engineering is necessary because of the many different concepts of its functions. In general, the engineer furnishes staff services, never administering, and takes executive action only when the organization cannot cope with a situation.

The functions of industry are sketched in the accompanying chart under the primary categories of Distribution, Finance, Acquisition and General Management. Every organization has to do with all of these functions, but in the varying degrees of application to its own principal function. There is no organization in existence that performs all functions completely and is wholly independent. Many functions are services furnished by other organizations.

No attempt is made, here, to depict a typical industrial organization, chart-wise, as there is no "typical" one. Each must be built around the job to be done, with properly selected personnel fitted into it.

The correlation of Industrial Engineering, as shown by the chart, functions with those of Industry. It may be seen that every engineering phase in Industry is covered by one or more departments of Industrial Engineering. Industrial Engineering is the correlated engineering of Industry.

Industrial Functions

I. DISTRIBUTION	Correlated Industrial Engineering Functions
A. MARKETING	
1. Market analysis	1a
2. Order taking and delivery scheduling	4a, b, c
3. Pricing	1d; 2a; 3b
4. Product development	7a
B. MATERIEL HANDLING	
1. Warehousing	5d; 9a
2. Inventory control	4a, b, c; 5d
3. Transportation and traffic	5d; 8b; 9b
C. SALES PROMOTION	
1. Advertising	10f
2. Personal contact and follow-up	10f
II. FINANCE	
A. PROVISION OF FUNDS	
1. Cash flow analyses—budgeting	1c
2. Credit and loan establishment	
3. Rentals	
4. Insurance	
5. Royalties	
6. Trade collections	
B. ACCOUNTING OF VALUES	
1. Bookkeeping	
2. Cost analyses	1c; 2a, b, c
3. Tax determination	
C. STOREKEEPING	
1. Inventory audit	
2. Receipt—quantity inspection	4a, b, c
3. Issue and shipment	4a, b, c
D. DISBURSEMENT	
1. Validation of expenditures	4a, b, c
2. Issuance of checks, cash and credits	4a, b, c
III. ACQUISITION	
A. PURCHASE	1a; 8d
1. Source development	
2. Contract placement	
3. Order follow-up	
B. PRODUCTION	
1. Manufacturing—machining, casting, forging	5a; 6b, c, d; 9a
2. Fabricating—welding, processing	5b; 6b, c, d; 9a
3. Assembling	5c; 6b, c, d; 9a
4. Packing	5f; 6b, c, d; 9a
5. Planning materiel flow	4a, b, c; 8b
6. Scheduling materiel flow	4a, b, c; 8a
7. Scheduling labor application	2a; 8a
8. Tool design	6a
9. Tool manufacturing	2a; 4a, b, c; 5a, b, c; 6c, d; 8a, b; 9a
C. INSPECTION & TEST	
1. In-process check with specifications	5e; 7d
2. Final check and tests to specifications	5e; 7d
3. Product operation trials to specifications	5e; 7d
D. MATERIEL HANDLING	
1. Storage	5d; 8b; 9b
2. Movement	5d; 8b; 9b, c
3. Inventory control	4a, b, c; 5d

IV. GENERAL MANAGEMENT	
A. DESIGN	
1. Preparation of drawings & specifications	5c; 7a, c
2. Determination of test & inspection requirements	5e; 7b, d
B. RESEARCH	
1. Development of product	1b
2. Development of product components	1b
3. Development of materials	1b
C. PERSONNEL ADMINISTRATION & TRAINING	
1. Employment	2c; 3c; 4a, b, c; 10a, b, c, e
2. Training	3c; 10d
3. Medical	10c
4. Safety	10c
5. Cafeteria operation	3a; 10c
D. OPERATING MAINTENANCE	
1. Proper use of equipment	1e; 6d
2. Adequate lubrication, cleaning and cooling	1e; 6d
3. Renewal of worn parts	1e; 6d
4. Recording of control data	1e; 6d
5. Provision of utility services	9f, g
E. MATERIEL REPAIR	
1. Removal and replacement	1a; 2a; 4a, b, c; 5c, d, e;
2. Reconditioning, reclamation	6b, c, d; 7d; 8a, b, c, d; 9a, b, c
F. PROCEDURE ADMINISTRATION	
1. Control of correspondence flow	1e; 4a, b, c; 9d
2. Follow-up of incomplete transactions	1e; 4a, b, c
3. Policing of procedures	1e; 4a, b, c
4. Recommending changes indicated necessary	1e
G. SECURITY ADMINISTRATION	
1. Watch service & patrol	1e; 4a, b, c; 9e
2. Entrance & exit inspection	1e; 4a, b, c; 9e
3. Policing of traffic regulations	1e; 4a, b, c;
H. COORDINATION	
1. Executive supervision of policy activation	2a, b; 3a, b

Industrial Engineering Functions

	Correlated with Industrial Functions
1. ANALYTICAL	
a. Market analyses	IA-1; IIIA-1; IVE-1, 2
b. Project analyses	IVB-1, 2, 3
c. Financial analyses	IIA-1, B-2
d. Personnel & plant use surveys	IA-3
e. Analyses of rules, regulations, procedures, etc., proposed and in use, and of their administration and resultant performance	IVD-1, 2, 3, 4, F-1, 2, 3, 4, G-1, 2, 3
2. STANDARDS	
a. Development of work performance measuring standards	IA-3; IIB-2; IIIB-7,9; IVE-1, 2, H-1
b. Development of budgets	IA-3; IIB-2; IVH-1
c. Development of wage structure	IIB-2; IVC-1
3. MANAGEMENT	
a. Functional organization of tasks and routines IVC-5, H-1 for performance of the functions of task and routine procedures and methods	IVC-5, H-1
b. Formulation of management policies to clarify executive thinking and to form the bases of action	IA-3; IVH-1
c. Job descriptions and evaluations	IVC-1, 2
4. PROCEDURES	
a. Drafting of integrated functional sequences with placement of responsibility within task or routine organizations for executive acceptance	IA-2, B-2; IIC-2, 3, D-1, 2; IIIB-5, 6, 9, D-3; IVC-1, E-1, 2, F-1, 2, 3, G-1, 2, 3
b. Development of forms for procedural use and of form flow in accordance with established procedures	IA-2, B-2; IIC-2, 3, D-1, 2; IIIB-5, 6, 9, D-3; IVC-1, E-1, 2, F-1, 2, 3, G-1, 2, 3
c. Devising means and methods for procedure policing	IA-2, B-2; IIC-2, 3, D-1, 2; IIIB-5, 6, 9, D-3; IVC-1, E-1, 2, F-1, 2, 3, G-1, 2, 3
5. METHODS	
*a. Establishment of parts manufacturing operations and sequences	IIIB-1 9
*b. Establishment of process techniques	IIIB-2, 9
*c. Establishment of assembly systems	IIIB-3, 9; IVE-1, 2
*d. Establishment of handling practices	IB-1, 2, 3; IIID-1, 2, 3; IVE-1, 2
*e. Establishment of inspection methods and standardization of specifications in collaboration with Design Engineers	IIC-1, 2, 3; IVA-2, E-1, 2
*f. Establishment of packing methods	IIIB-4
6. TOOL ENGINEERING	
*a. Standardization of die, pattern, jig, tool and fixture design and specifications	IIIB-8
*b. Standardization of tool application	IIIB-1, 2, 3, 4; IVE-1, 2
*c. Machine tool and production equipment specification and application	IIIB-1, 2, 3, 4, 9; IVA-1, E-1, 2
*d. Development of tool and equipment maintenance practices	IIIB-1, 2, 3, 4, 9; IVD-1, 2, 3, 4, E-1, 2
7. PRODUCT DESIGN	
*a. Specification of functional requirements to meet the customers' needs	IA-4; IVA-1
*b. Collaboration with Tool, Methods, Production and Standards Eng'rs in tolerance setting	IVA-2
*c. Material analysis	IVA-1
*d. Set-up of check inspection specifications	IIC-1, 2, 3; IVA-2, E-1, 2
8. PRODUCTION ENGINEERING	
a. Systemization of materiel scheduling and of labor dispatching	IIIB-6, 7, 9; IVE-1, 2
b. Analyses of work loads and of materiel flow	IB-3; IIB-5, 9, D-1, 2; IVE-1, 2
c. Diversion of scrap for reclamation	IVE-1, 2
d. Purchase assistance through source development	IIIA-1; IVE-1, 2
9. PLANT ENGINEERING	
*a. Conduct of plant and shop layout studies	IB-1; IIIB-1, 2, 3, 4, 9; IVE-1, 2
*b. Preparation of materiel handling equipment specifications	IB-3; IIID-1, 2; IVE-1,2
c. Preparation of transportation equipment specifications	IIID-2; IVE-1, 2
d. Preparation of communication equipment specifications	IVF-1
e. Placement of fire and trespass security facilities	IVF-1, 2
f. Operation of utilities	IVD-5
g. Provision and distribution of services	IVD-5
h. Collaboration with other engineers in specifying for equipment, plant and structures	
10. INDUSTRIAL AND PUBLIC RELATIONS	
a. Study of personnel policies	IVC-1
b. Employment statistics	IVC-1
c. Employee relations betterment programs	IVC-1, 3, 4, 5
d. Development of training methods, aids and manuals	IVC-2
e. Development of aptitude tests and personnel selection guides	IVC-1
f. Development of information to the public	IVC-1, 2

The foregoing tabular digest of Industrial Engineering functions applied to Industrial functions, while adequately comprehensive, is not all inclusive. For instance, none of the following services required by Industry are within the scope of Industrial Engineering:

Architectural
Administrative
Appraisals
Auditing
Legal
Medical or
Detectival

In the simplest of organizations, the man on the job does his own Industrial Engineering as well as performing most other services for himself. He is no problem to a management which is also simple and crude. Trying to perform so many functions, the man cannot be expected to display proficiency in many of them—people aren't made that way. The more a person can specialize according to his own temperament and bent, the more proficient he should be in concentrated effort. With expert engineering worked out in usable shape for a worker by engineers and directed by executives, or routinely administered by administrators, the joint effort will prove very effective. Implicit in the latter arrangement is a very high order of management.

Decentralization is premised on delegating all duties, and their associated responsibilities and authority as close to the scene of action as is consistent with maintaining correlated uniformity between the units of an organization. Furthermore, expert talent is limited and expensive and cannot be dispersed down into many parts of an organization but must be concentrated for fullest general availability.

Where the full time engineering talent of one or more engineers can be used, it should be provided if at all possible. Such localized applications, however, require coordination from the top for the fullest advantages of staff cooperation and uniformity.

It may be seen that the services of some departments or phases of Industrial Engineering can be furnished only "on hire," from outside an organization, if there is not a full-time need for their expert talents. It is not only uneconomic to keep such abilities in standby but top talents will not lie fallow long—they will move on or dry up.

Other of the Industrial Engineering services must be concentrated in the headquarters while still others can be advantageously applied continuously closer to the work. The closer the application, the less the filtering and the less dimmed and distorted the engineers' ideas are in consummation.

As a working principle, engineers as well as other workers should "report to" the Executive with whom their work is associated. It is practicable that the technical character of their work be guided by the Chief Industrial Engineer, from within or outside the organization. The Executive is responsible for getting work done—on time and economically. The Engineer advises the Executive and workers, professionally—responsible for quality. This division of responsibility is functional, avoiding the conflict between "getting the work out" and "getting it done right" which is very inhibitive when one man is solely responsible for both. Any conflicts that do crop up are clearly delineated and as such resolvable by higher, common authority.

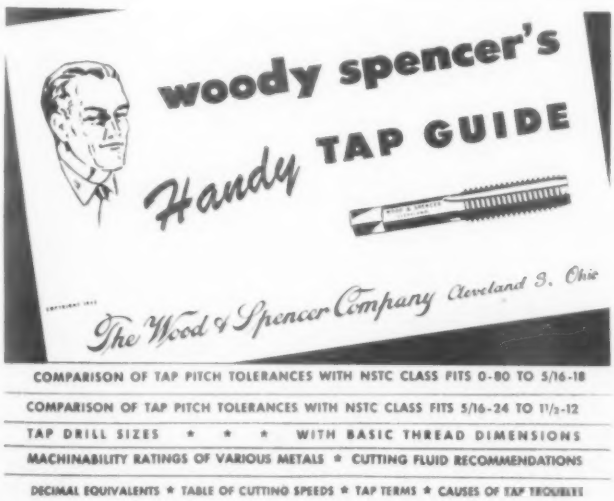
If too few phases of Industrial Engineering are applied to an organization and its facilities, there is grave danger of reducing the overall efficiency by unbalancing the whole. Lopsided "efficiency" or superficial effectiveness in one Industrial department can destroy or seriously weaken the organization in its effectiveness as an entity. Common cases of this are: bookkeeping, and in particular, timekeeping, carried to such a nicety that operations are impaired by an overweening striving for exactitude; transportation and materiel handling systems which are apparently efficient in themselves but which give rise to operational delays; design engineering which gives the customer results beyond his requirements and purse—and a headache to operations. Actually, cases have been observed of such overstressing and unbalance in all phases of industrial activity. A good engineer takes up an equal strain all around.

The uniformity is not a case of reducing all activity to the lowest common level. It is, rather, establishing uniformity of directed effort with well distributed, balanced results. Static balance, with established procedures routinely administered, is not difficult of attainment. Dynamic balance, with executive action at work, is much more difficult—but essential when the work is not or cannot be readily routinized.

Industrial Engineering embraces all Industrial activity, as it must for proper, correlated coordination. Over it there must be centralized controlling direction. A little engineering here and there is worse than none at all. Complete, thorough staffwork is an essential.

A Handy Tap Guide

An unusually complete Tap Guide, recently developed and compiled for the Wood & Spencer Co., Cleveland 3, is available to anyone interested in tapping. The only reservation is that requests be on company stationery. This guide contains practically all of the data and information needed to cover practically any tapping problem one may run across.


woody spencer's
Handy TAP GUIDE
The Wood & Spencer Company Cleveland 3, Ohio
COMPARISON OF TAP PITCH TOLERANCES WITH NSTC CLASS FITS 0-80 TO 5/16-18
COMPARISON OF TAP PITCH TOLERANCES WITH NSTC CLASS FITS 5/16-24 TO 1 1/2-12
TAP DRILL SIZES * * * WITH BASIC THREAD DIMENSIONS
MACHINABILITY RATINGS OF VARIOUS METALS * CUTTING FLUID RECOMMENDATIONS
DECIMAL EQUIVALENTS * TABLE OF CUTTING SPEEDS * TAP TERMS * CAUSES OF TAP TROUBLES

A New, Free Machining Tool Steel

FROM 25 per cent to more than 200 per cent faster machinability is claimed for a new tool steel recently announced by the Allegheny Ludlum Steel Corporation, Brackenridge, Pa. The new product identified as "Dunkirk EZ," is a free-machining steel and is described as being "outside the usual tool steel specifications, with extraordinary possibilities in the fields of cold work applications and tool steel machined parts, such as dies, gauges, forming rolls, bushings, liners, and bodies for multiple-edge tipped tools."

Extensive research in steel making techniques paved the way for the introduction of the free-machining oil hardening steel. Its free-cutting qualities make it adaptable for tool steel parts turned out on screw machines and turret lathes, where fast machining is desirable. In addition, the comparative ease with which the new metal is worked provides longer life for the tools used in working it.

According to the makers, "Dunkirk EZ" will harden to about 65 Rockwell "C" when oil quenched from 1450-1550° F.; may be tempered up to 500° F. without softening under 60 Rockwell "C"; is rather deep-hardening, which assures proper hardness even in large sections; undergoes very slight dimensional change in heat treatment and possesses higher impact and transverse rupture strength than most other oil-hardening tool steels. Unusual resistance to wear and abrasion is claimed as an outstanding characteristic of this new tool steel.

By John E. Hyler

Automatic Multiple-Dip Pickling

Timed immersion and automatic dip and lift, tank to tank, insures correct, pre-determined interval in each solution.

VARIOUS methods put into use for automatically putting work through a series of dips in pickling, are highly interesting. Can you imagine a pickling machine setup in which there is a number of tanks, adjoining one another in a straight line, and an automatic conveyor arrangement, designed in such manner that the amount of time the work remains in each tank of solution may be predetermined, and so that the work will automatically be lifted out of one tank and placed into the next one, when that time has elapsed, and that this will be repeated until the work has made the full-length run of the series of tanks, spending the predetermined length of time in each tank? This has been accomplished in one highly-developed pickling machine that has been noticed.

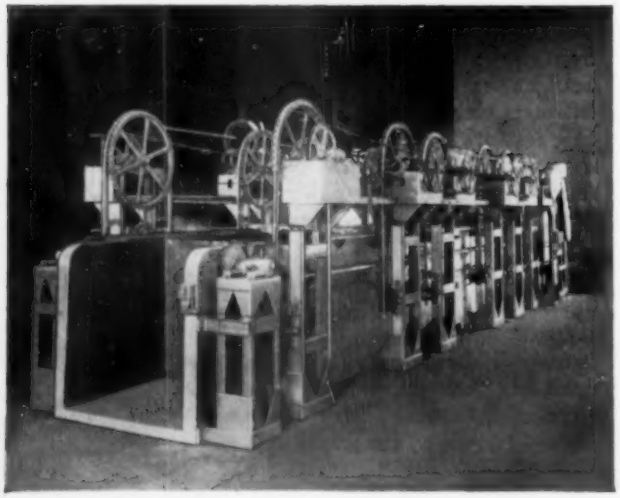
John E. Hyler, who joins the ranks of contributors to the TOOL ENGINEER with this issue, has a broad background in industry. For the past 25 years he has devoted himself to technical writing and research and has gained a wide following through his articles in the leading technical magazines.

Assume these various tanks to be of the same height and the same width, all the way down the line, though their lengths may vary, according to the relative length of time one wishes work to be subjected to the solution in each tank. All tanks being the same width and height, they can be and are provided with a continuous chain-way, along each of the two edges. On these two chain-ways run two chains, in parallel, at very slow speed. Across these chains, the operator places round bars, and these bars serve to support the work, in one way or another. Sheets, steel sash and similar work are suspended from these bars by chains, with clamps or hooks. Baskets are suspended from the bars for some types of parts. Hairpin hooks are suspended from them, to accommodate coils of wire, or similar work. Thus, with the bar traveling slowly along on the two parallel chains, the work is carried slowly through the solution in each individual tank in turn.

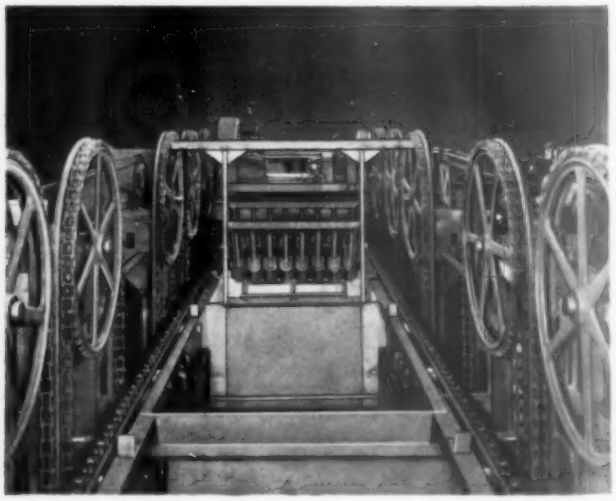
The arrangement is such that just before the work reaches a partition between two of the tanks, the supporting bar encounters a pair of stops, arranged on the top edges of the tanks. Also, in line with each of the partitions,

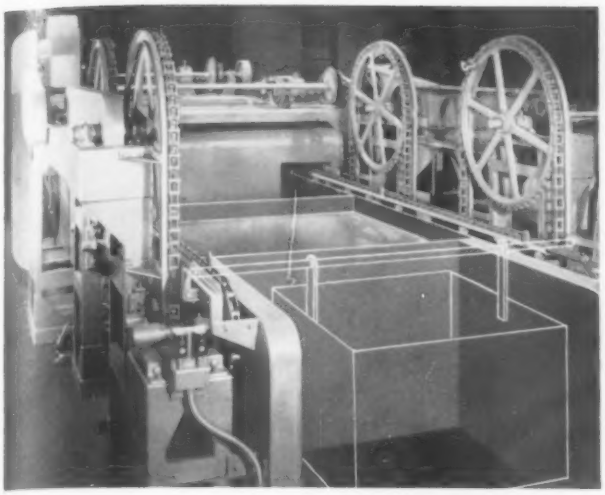
The special pickling baskets described in the text are installed permanently on an overhead chain conveyor which travels them through a series of pickling dips. Note the dump bottoms, and the special latching arrangement which allows the baskets to be dumped automatically by a tripping bar, as they come into dumping position above a hopper. Photograph courtesy of Rolock, Inc., Fairfield, Conn.

An overall view of the machine, which is designed for loads up to 2000 lbs. on acid resisting trays. Advantages of design are flexibility and the utter elimination of any need for accurate timing.

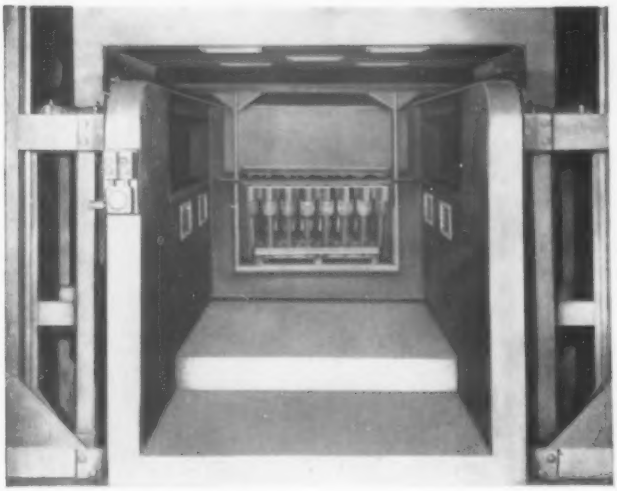


An end view of the machine, with a load coming from the solution. Also shown is the arrangement of the lifting chains and the horizontal transfer chains, as well as the stops on the sides of the tanks.





Work hangs on a horizontal bar which rests on flat top chains, and is lifted, between the lifting points between the tanks, by the attachments shown on the vertical chains. This construction has the advantage that accurate timing is not essential since the horizontal chains carry the work to the stops, where it stays, with the chains sliding underneath, until raised to the next tank by the lifting chains.



A load of parts in a carrier. The section shown is the end of the machine, which is the dryer. Note the louvers through which hot air is blown onto the work. The parts being closed at one end, carrier arrangement is such that the work enters the solution with the open end up, to eliminate air pockets, with automatic tilting on withdrawal to insure thorough drawing.

there is a vertically-traveling chain, on each side of the tank assembly, and exactly opposite, running upward on the side from which the work has approached, over the top of a large-diameter sprocket, and down again on the other side. On these vertically-traveling chains are arranged special pickup devices, designed to engage the ends of the work-supporting bars, and to pick them up. The stops mentioned are placed so they bring the bar to a stop with its ends in perfect registration with the travel route of the pickup devices, on the ascending sides of the vertically-traveling chains. The vertically-traveling chains on the two sides of the tank are positively timed together, and thus have their pickup devices always maintaining a position in a common horizontal plane.

With these adaptations, as the work-supporting bar encounters the two stops, it is stopped and held there, while the two horizontal chains simply slide beneath it. There it stays until the following pair of pickups engage the horizontal bar, when it is lifted, and carried straight upward. Thus, the work is lifted straight up out of the tank, to a point where it will clear the edge of the partition, before the work-supporting bar starts to follow around the top of the sprockets. As the bar is carried around a 180-degree arc of the sprockets, the lifted work is transported over the edge of the partition. As the bar follows down on the descending sides of the vertically-traveling chains, the work is lowered into the next tank of solution, the bar coming to rest again, on the slowly-traveling pair of horizontal conveyor chains, to again take up its slow travel, along the second tank of solution, until it encounters the next pair of stops at the next pair of vertically-traveling chains.

There is also means provided for vibrating the work-carriers while the work is in the solution, to accelerate the action of the solution. The vertically-traveling chains are of course entirely independent of the horizontally-traveling chains, as touching their speed. Therefore, the work may be carried through the solution very slowly, and yet transferred from tank to tank swiftly, in cases where it is necessary, to prevent staining or other bad effects.

Overhead Chain Conveyor Baskets

You have often noted that overhead chain conveyors can be made to travel up and down grade, and because this is true, they have often been used for multiple-dipping jobs. They have been so employed on different occasions on pickling layouts. Possibly you have observed workpieces that are quite small being carried in baskets of different kinds while suspended from chain conveyor hooks, for pickling and other operations. But have you ever seen special baskets which were made for *permanent* attachment to such a conveyor? The illustration shows baskets of this kind, which remain continually on the conveyor, and which, in addition, are loaded by hopper. The basket is cubic in form, measuring 9″ x 9″ x 9″ inside, and the special rigid "bails" of bearing type with which they are fitted, and which permit them to retain an upright position on the conveyor at all times, can be clearly seen.

These were designed to use on a conveyor installation for pickling, to take care of different sizes of tire valve stems. The baskets are loaded by a hopper, as mentioned, and then go through a series of dips, by traveling with the chain conveyor. After passing through all of the dips, they pass over a tripping bar. You will note pivoted arms that protrude beneath the basket. As the baskets pass over the tripping bar, it strikes these pivoted arms, pushing them back. This causes the latch to release, and allows the bottom to drop, dumping the pickled work into another hopper. The baskets then continue on their way around the conveyor, and back to the beginning of the cycle, making the operation continuous.

The multiple-dip pickling equipment or machine described in the first portion of this article is a layout designed and built by N. Ransohoff, Inc., Cincinnati, Ohio, to whom is credited the courtesy of the four photographs.

The baskets illustrated, for use in an overhead chain conveyor multiple-dip pickling installation for tire valve stems, are made by Rolock, Inc., Fairfield, Conn., and undoubtedly baskets of this kind could be fitted to such conveyors as made by Link-Belt Co., Chicago, Ill., by Jeffrey Mfg. Co., of Columbus, Ohio, and various others.

Plastic Engineers to Hold Show

The **SOCIETY OF PLASTICS ENGINEERS** is to hold a Plastics Exhibit at Convention Hall, Detroit, January 7 through 11, in conjunction with the Annual Meeting of the Society. The meeting will be held January 7, 8, and 9 in the rooms of the Engineering Society of Detroit, the Rackham Memorial Foundation, 100 Farnsworth Ave.

By E. W. Siegel

"Plus" Methods Enhance Tool Life and Product Quality

Coordination and follow-up minimizes tool failure and break-down.

For more than 19 months, the Columbus Ohio, plant of the Curtiss-Wright Corporation met or exceeded all schedules for the building of SB2C Helldiver bombers and SC1 Seahawk planes for the Navy, all without any sacrifice of the precision machine work for which the plant is noted.

IN MAINTAINING this high quality of machine work at the Columbus plant, a special program has been worked out for the selection, use and care of cutting tools. The program has resulted in increased tool life, decrease in machine down time, increase of quality production and greater satisfaction for operators and management.

Following is a resume of the main steps in the program:

(1) Proper selection and adaptation of the tools themselves.
(2) Proper selection of grinding equipment.
(3) Correct selection of grinding wheels (in conjunction with an abrasive company's representatives' recommendations.)
(4) Skillfully supervised operators.
(5) Careful set-up and workmanship.
(6) Tools quality ground and honed.
(7) Holden Hy-Speed Casing applied.
(8) All work closely coordinated, with adequate follow-up.

The first five basic items are self-explanatory. Number 6 in the list concerns the producing of a quality ground tool. Standard grinding procedures are followed, making sure that the operators do not crowd the work by either too heavy a feed or too fast a speed. This care assures against overheated or burnt cutting edges. Coarseness of the ground surface is also minimized. This is essential in prolonging tool life, and results in a higher quality product, decreased machine down time, etc.

The next procedure is the careful honing of the ground tool, with the honing done across the ground surface. The honing operation minimizes the possibility of starting tool failure and final actual breakdown. Also, considerable increase of production was realized per grind of tool after this operation.

Finally, Holden Hy-Speed Casing was applied. The Holden Hy-Speed Case is a secondary treatment for High Speed Steel Cutting Tools. It is used to impart an increased surface hardness to high speed tools previously hardened, tempered, and ground to size.

Earl W. Siegel studied electrical engineering at Buffalo Tech, where he later took up evening courses in tool design. Upon graduation, joined Curtiss-Wright, Buffalo plant, as electrician's helper. Then, stepped up to assistant, Machinery and Equipment Engineering Department, was transferred to the Columbus Ohio plant, as engineer in a corresponding department. He is a member of Columbus Chapter, A.S.T.E.

The Holden procedure as recommended was used with the following deviations. The equipment available was used. After the casing at 1025° F. for the required length of time, the tools were cooled in air, and soaked in an alkaline cleaner to remove surplus salt. The chart indicates blued and not blued. The tools marked "not blued" were processed strictly as directed in the Holden Bulletin. The tools marked "blued" were given a secondary treatment. Having been cleaned, they were placed in a 50% sodium and 50% potassium nitrate bath at 925° F. for the time designated. This operation gave the tools a blue, slick, slippery finish, which reduced cutting friction considerably.

After this nitrate treatment, the tools were cooled and rinsed free of salt in an alkaline solution. They were then

PRODUCTION and TOOL ANALYSIS CHART NO. 1

	Tap	Thread Chaser	Rough Form Tool	Finish Form Tool	Mill Cutters
Part	Steel Tube	Turn Buckle	Cylinder	Cylinder	Coupling
Operation	9/16 x 18 N.F. .1 Tap	10 x 24 L.H. Chaser	Spade Form	Spade Form	Gang Mill Straddle
Speed	270 R.P.M.	258 R.P.M.	17 R.P.M. .004	17 R.P.M. .004	61 R.P.M. 1¼
Material	4130	2330	4340	4340	4140
Hardness	180,000 T.S.	150,000 T.S.	180,000 T.S.	180,000 T.S.	125,000 T.S.
Normal Prod. Per Grind	100	200	3 to 4	3 to 4	300
H.H.S.C.* Per Grind	315	1850	20	59	1589
Tools Cased Comments	30 Min. 1025°F. Not Blued	Same	60 Min. 1025°F. Not Blued	45 Min. 1025°F. Blued 925°F. Min.	60 Min. 1025°F. Not Blued
Machine Used	Drill Press	Threading Machine	Turret Lathe	Turret Lathe	Prod. Bed Type Mill

dipped in a rust preventative to protect them until used, no further finishing being required.

An item of importance is the use of properly designed racks and baskets that will eliminate nicking and marring of the cutting edges. It has also been found advisable to keep all tools of a delicate nature wrapped in heavy paper or some protective agent during transportation and storage.

The type of tools put through the process were: taps, thread chasers, rough and finish form tools, drills, mill cutters, lathe form tools, hobs, spade drills, and chamfering tools.

The Production and Tool Analysis Charts (1 and 2) indicate the results that Quality Tool Grinding, Honing, and Casing * have on increased tool life and increased production.

As noted on the Charts **, this was the only case where deviation from the normal speed and feed was made. This was due to the special feature of the tool in addition to the above mentioned items that were coordinated and followed to assure the conditions desired.

To summarize, all work from the selection of the tools and grinding wheels, workmanship of grinding operations, applications of casing, and careful use of tools in production through proper instructions to operators and supervision and increased production, are the resultant factors of a tool man's work properly coordinated and adequately followed up.

PRODUCTION and TOOL ANALYSIS CHART NO. 2

	Lathe Tool	Thread Hob I.D.	Thread Hob I.D.	Multi-Chamfering	Special Production Drill
Part	Collar	Cylinder	Cylinder	Cylinder	Plunger
Operation	Form Turning	Thread I.D.	Thread O.D.	Chamfering 5 Tools	1—1/32" Drill
Speed	17 R.P.M. .004	103 R.P.M.	72 R.P.M.	17 R.P.M. .004	** 135 R.P.M. .007
Material	4140	4340	4340	4340	8630
Hardness	150,000 T.S.	180,000 T.S.	180,000 T.S.	180,000 T.S.	125,000 T.S.
Normal Prod. Per Grind	20	30-35	30-35	30	10 @ 101 R.P.M. .004 Ft.
H.H.S.C.* Per Grind	143	84	76	109	164
Tools Cased Comments	60 Min. 1025°F. Blued 925F°. 45 Min.	Same	Same	60 Min. 1025°F. Blued 925°F. 30 Min.	45 Min. 1025°F. Blued 925°F. 45 Min.
Machine Used	Turret Lathe	Thread Mill	Thread Mill	Turret Lathe	Radial Drill

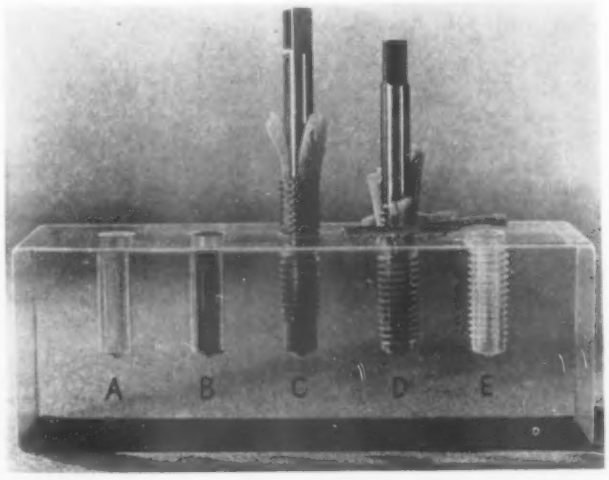
NOTE, in both charts:
*Holden Hy-Speed Case
**Only Change in Speed *and* Feed

Tap Cartridge for Blind Holes

A comparatively recent innovation permits tapping to the bottom of blind holes with no allowance necessary for chip clearance. Manufactured by Tap-Cartridge, Inc., Cincinnati, the method is said to result in smoother and more uniform threads than are usually produced in a through hole—in fact, through holes have been blocked to insure the advantage of cartridge tapping.

The method is very simple. After drilling, a hard, plastic, extrudable cartridge of proper diameter is dipped into the hole. When tapping, the cartridge extrudes, picking up all chips as they are cut and forcing them to flow with the material up through the flutes. With cartridge tapping, no lubricant or coolant is required.

The phantom photograph, Fig. 1, shows the stages of tapping. At A, the drilled hole; at B, a cartridge inserted; at C, tapping (note extrusion of chips); and D, the tap at the bottom of the hole. At E, the completed hole. Fig. 2, extrusions from tapped hard silicon aluminum, showing chip impregnated extrusions. Note that chips are held near the cutting edge of the tap; thus, any chips not extruded prior to the reversal of the tap cannot become wedged in the relief during withdrawal.



THE *Fundamentals* OF TOOL ENGINEERING

Elements of Gearing

No. 3 of a Series

Technical Editor,
The Tool Engineer:

In reading the editorial and studying the sketches (Elements of Gearing, October, the *Tool Engineer*) I noticed that the linear pitch of the single thread worm in Fig. 3 is shown to be . . . equal to the tooth thickness of the rack in Fig. 1. I am sure that this will be misleading. . . . The linear pitch of a worm or rack is the distance between centers of two adjacent threads or teeth and equal to the circular pitch of the mating gear or pinion.

Yours truly,
G. J. Osborne.

Mr. Osborne is right, and his letter is in line with several others calling attention to the same obvious error. This, and the fact that the article was first in a series, and therefore somewhat generalized, resulted in some confusion. We will therefore defer discussion of the stub tooth, scheduled for this issue, and confine ourselves to worms and worm wheels. And, as in the preceding installments, we will continue the use of the Brown & Sharpe symbols until later in the series.

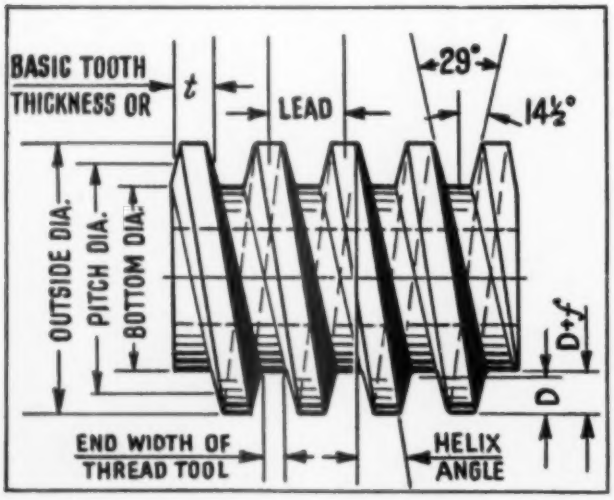
The original Fig. 3, with the error in question corrected,* is shown here as Fig. 1. To the original descriptive paragraph (13 in October issue) we will add the qualifying supplement: *In the single thread worm shown, the nominal circular pitch* (here called linear) *corresponds with the lead. In a double thread worm, the lead would be twice the linear pitch; in a triple thread, three times, and so on for each multiple. The lead determines the helix angle, of which more below.*

Referring to Fig. 1, it will be seen that the helix angle is based on the O.D. However, a chased worm—i.e., one cut on a lathe—was in mind, and when worms are chased the helix angle takes care of itself. The lathe is geared to cut so many threads per inch, or such leads as may ordinarily be cut with stock change gears. To avoid further confusion, it should be noted that, while so shown in the illustrations, worms and worm wheels are not ordinarily made to diametral pitch, but to circular (linear on worms) pitches evenly divisible in the inch. However, certain stock worms and wheels which are widely used are listed in diametral pitches and, since the method of calculating the helix angle would be the same regardless of the pitch used, we will carry the plain worm and wheel through to a conclusion on this premise.

Actually, three helix angles occur—one on the root diameter, one on the pitch circle and one on the O.D., as at

** Late delivery of plates, this installment, precluded adequate checking. Several minor errors occur, with corrections noted in captions.*

NOTE: D and D+f, Figs. 1 and 2, should read D" and D"+f.



NOTE: .2168 dimension, upper right, should read .2618".

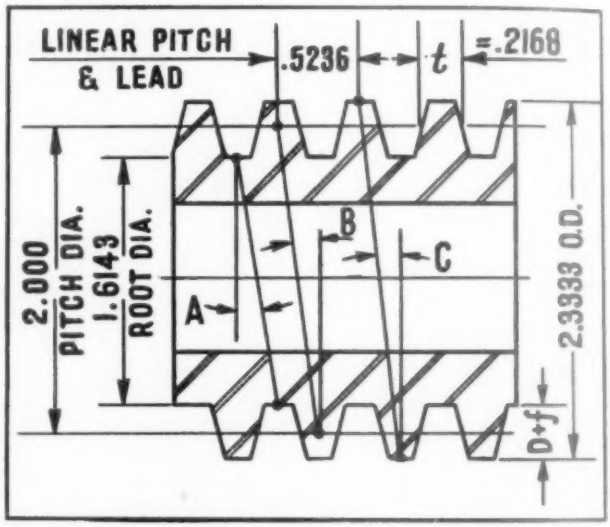
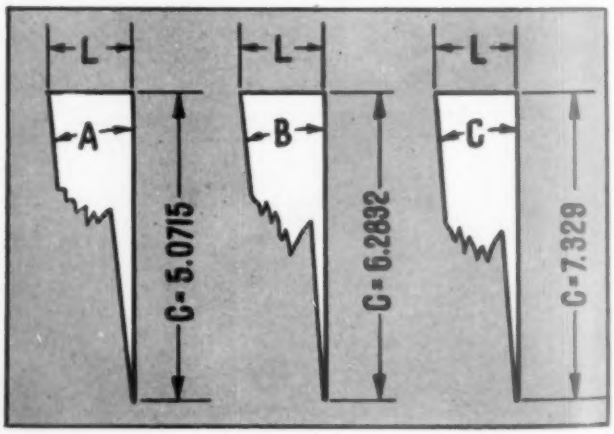


FIG. 1, left. *FIG. 2,* above. *FIG. 3,* below.



A, B and C, Fig. 2. Of these, only angle B (based on the pitch circle) is important inasmuch as it must coincide with the helix angle of the wheel. One may, however, run a worm in combination with a straight cut spur gear by placing the shafts at an angle corresponding to the helix angle of the worm.

When cutting a worm on a thread miller, or on a dividing head in a universal miller, it is essential that the cutter head be set exactly to the helix angle on the pitch line—i.e., to angle B—as any marked deviation would tend to change the tooth form. As in the case of the lathe, the lead is determined by the change gears which, in a single thread worm, also directly establish the linear pitch. In the case of multiples, one thread is cut at a time, with index for each successive tooth or thread.

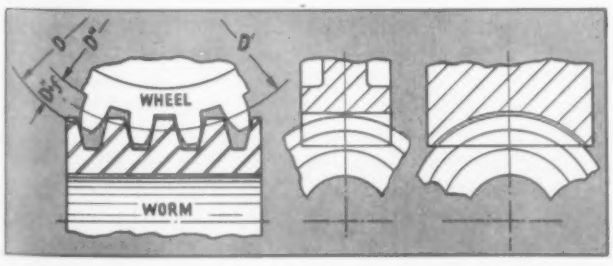
A simple method of ascertaining the helix angle is shown in Fig. 3, which is supplementary to Fig. 2. We will assume the worm to be single thread, 6 diametral pitch (.5236″ linear) and 2.000″ pitch diameter. A triangle is now established with the pitch circumference as the perpendicular and the lead—.5236″—as the base. In the illustration, these are respectively designated as C (circumference) and L (lead). Resolved into simple formula, then: $\frac{L}{C}$ = tan of helix angle. Or, designating the pitch diameter as D′, then: $\frac{L}{D' \times \Pi}$ = tan of helix angle. Put in plain figures, this would be: 2.000″ × 3.1416 = 6.2832 / .5236″ = .08333 = tan 4° 46′—near enough, for purpose of illustration, for the helix angle B.

Should it be desired to establish angles A and C, then, add twice the addendum (.1666″ for 6 diametral pitch) to the pitch diameter, which establishes the O.D. as 2.3333″. Now subtract twice the full tooth depth (D″ + f) or .3595″, which establishes the root diameter as 1.6143″. Then, proceed as above for both A and B when, from circumferences 5.0715″ and 7.329″ and the common lead (.5236″) we arrive at .10304 and .07144 respectively as tangents of 5° 53′ and 4° 5′—near enough for angles A and C. Note, here, that we are dealing with elements, and that the intent is to show aproaches to problems, not to affect their ultimate solution.

Plain worms, running in combination with helically cut wheels, have the disadvantage that load is localized, resulting in rapid wear. See center illustration, Fig. 4. This condition may be relieved by running a worm with a hobbed wheel, as at the right. This distributes bearing over the major tooth area of the wheel, with decreased pressure per unit area and consequent longer life. Worm drives of this type are ordinarily used for index mechanisms where, action being intermittent and loads comparatively light, they wear indefinitely.

So far, we have dealt entirely with simpler worms and wheels. As a marked improvement over this type, there are the generated worms and wheels of which the Hindley and the Cone-drive are familiar examples. They are also used in automotive steering gears, notably (so the writer understands) in the Gemmer gears. An illustrative example is shown in Fig. 5. Here, however, the teeth are shown modified involute whereas, in actual application, they are straight sided with full flank contact between worm and wheel; also, the pitch line of the worm is on an arc conforming with the pitch radius of the wheel. Thread form is uniform, with the center line converging at the center of the wheel, hence, the entire tooth flank bears against a number of teeth in the wheel for each turn of the worm. The increased contact area reduces friction and horse-power required, besides adding immeasurably to the life of the drive.

FIG. 4. **Plain worm and spur helical wheel at left and center. Hobbed or semi-throated wheel and worm at right.**



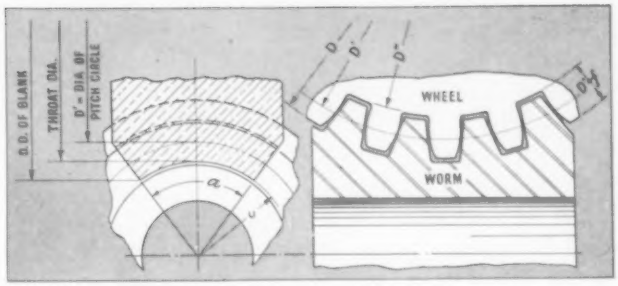


FIG. 5 **Generated worm and wheel. Note arc of worm pitch line coinciding with pitch radius (D′) of wheel.**

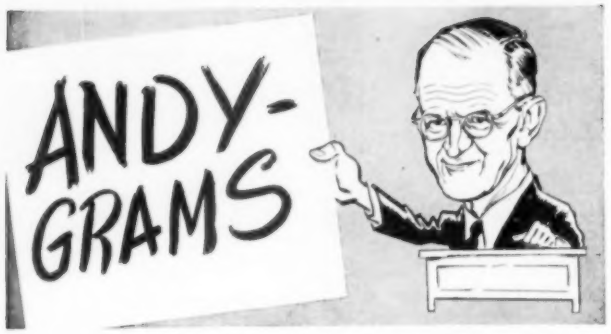
As the helix angle is progressively variable from the center to both ends, method of processing is radically different from that employed in the cutting of the plain worm. Generated worms are cut in ingeniously designed and extremely accurate special machines; however, the principle of operation is rather simple and, for purposes of illustration, may be described by analogy.

Refer to the right hand view, Fig. 5. Now, visualize any one tooth in the wheel as an inserted form tool, with the wheel as the cutter body. Set the tool, from the center, so that its pitch line exactly coincides with the pitch radius of the wheel. Mount it on an arbor in a dividing head, set vertically on the table of a universal miller, and with the top (cutting edge) of the tool dead center with the machine spindle. Then, mount the worm blank on the spindle arbor. Gear the dividing head so that it will run in synchrony with the spindle—e.g., the ratio for a double thread worm and a 30 tooth wheel would be 15: 1.

When all set, start the machine and, with both cutter and worm rotating, feed the tool in for each revolution until full depth is attained. With both tool and wheel running in synchrony, it should be obvious that the cutter would act on the worm largely after the manner of chasing in a lathe. The main difference being that the tool sweeps on an arc instead of cutting on a straight line.

While plain worms and wheels may be calculated as for spur gears, using either diametral or circular pitch—the latter commonly used—throated wheels of the type shown in Fig. 5 require a different approach. Since, however, space limitation precludes adequate treatment, the reader is referred to the handbooks on gearing for the formulas used for their calculation. In general, however, the O.D. will vary with increase or decrease of the face angle α which, incidentally, is being discarded in late practice. Instead, the O.D. of the wheel coincides with the intersection of the pitch circles of the worm and wheel. Thereby, a greater tooth contact is obtained. The throat radius U will also vary with the diameter of the worm.

Due to power losses from sliding friction as contrasted to the rolling contact of gears, plain worm drives have been considered less efficient than spur or bevel drives. A distinct advantage, however, is a comparative absence of shock and chatter, and even backlash can be compensated for by providing adjustment in the mounting. These features, together with high torque and low reduction, make them prime favorites among machine designers.



"From the first issue, the NEW TOOL ENGINEER has been reliable . . . informative . . . the *Fundamentals of Tool Engineering* instructive . . . but in 'The Elements of Gearing' . . . October . . . the author rambled . . . guessed . . . drawing of worm wrong . . . tables and symbols obsolete . . . why doesn't he have his stuff checked by experts? . . . why not copy from standard reference books? . . . no harm in plagiarizing (oh no?) . . . copyrights run out (oh yeah!) . . ." And so on and on, the whole a sample of a barrage of verbal brickbats a/c an error in *The Elements of Gearing,* October issue. All of which bears out the saying that a doctor can bury his mistakes but a boner by a tool engineer is a monument forever.

Well, we've had so many bouquets that a bit of panning is a diversion, besides tending to reduce possible inflated ego. It happens, however, that writing is often misinterpreted, and just as often, one mistake in an article may prejudice a reader against the whole. And that, I believe, was the case here, since most of the criticism centered on a dimensional error in the drawing of the worm. Be that as it may, it is one of the unwritten laws of editorial writing that one never retracts, never explains and never apologizes. You've said it—in print—"nor all your Piety nor Wit shall lure it back to cancel half a line, nor all your tears wash out a word of it."*

But, as Bob Douglas said: "To heck with craven subservience to the law!" As a matter of fact, the October *Fundamentals* came through 'way past the deadline and, up to my hips as I was in Jim Scott's famous alligators, I slipped up in checking. Then I didn't get a chance to review the article until, invited up to Hamilton Chapter, I packed my grip with the latest references and spent the entire time, to and fro enroute, in going over each of the 17 paragraphs and the several illustrations and tables. That done, I vented a sigh of relief and relaxed. True, the article could have been improved by re-writing but, with the exception of the drawing of the worm, the whole was in line with intent. In this connection, a number of "experts" called me up when, in person to person conversations, it was generally agreed that tables, figures and all were pretty well in in line and in nowise obsolete.

~ ~ ~ ~

Right here, I want to make it clear that the *Fundamentals* are not written for the experts, but for students and beginners who are unversed in the various processes of manufacture. For that reason, they are written in simple, informal language, with the illustrations often exaggerated rather than precise. Nor is there any attempt at involved formulas; the idea is to show the *approach* to a problem rather than to effect its solution to the Nth. power. That so many old timers find them interesting and instructive—as attested by scores of letters—does not alter the fact of their being.

* *Note to Bill Dawson: The above is from Omar, not Shakespeare.*

Now, don't get the idea that I make light of mistakes, or that I am trying to turn the shafts against my critics, using that term advisedly. The criticism was constructive and taken in the spirit tendered, the whole tending to make me more conscious of my responsibilities. If only I could be a few more men rolled into one!—like Nathan Hale, one of my regrets is that I "have only one life to give to the A.S.T.E."

~ ~ ~ ~

Let me tell you a story. While still a youngster, I was sent into the hinterland to fix a machine that had bogged down a/c too much theory. In a rather involved, compound transmission, several score gears out of several hundred had stripped teeth. And all were specials—spirals, (or helical, to be exact), worms, spurs and bevels—with no immediate prospect of replacement. I got there on a Tuesday, with orders to have the machine running by the following Monday—or else!

Fortunately (?), I was assigned an assistant, a recent graduate from—well, never mind the Alma Mater—but, unfortunately, he'd left his handbooks in town, which was a long way off. It happened, however, that a crossroads repair shop boasted an antediluvian universal miller with a dividing head, a screw cutting lathe, the usual run of bench tools, acetylene welding equipment and a hand forge. It happened, too, that in gadding around I had acquired a somewhat rudimentary knowledge of gearing and (also fortunately) remembered the trig functions for the 30° and 45° angles—the most commonly used. So, laying out tooth forms on rusted sheet iron (which also made templates) and forging out old files, chisels and crowbars—anything that would make tools—I made fly and rotary cutters (sans back-off) the while my helpers forged out gear blanks from such mild steel as we could salvage.

We chased worms on the lathe, "hobbed" wheels by the in-and-out method, cut spur and bevel gears and, charring bone and scrap leather, even pack hardened them. No, we didn't get going by Monday, albeit soon enough to suit the Old Man—at least, he gave me a raise—and, while the gears were not up to modern precision standards they nevertheless compared favorably with the product of the time. The point is that the tools were made, and the gears cut, by the very methods so far outlined in *The Elements of Gearing.* Even my assistant declared that he learned more about gears and gearing in a few intensive days than he'd learned during four years at college. So, if the experts will leave us young fellows to learn the hard way, with allowance for occasional boners—we'll try not to pull the same ones twice—we'll muddle through somehow.

~ ~ ~ ~

As aforesaid, I was invited up to Hamilton Chapter, going 'round-about via Ontario where, the hotels being jammed, Eric Crawford, Toronto Ch'man and editor of *Canadian Machinery and Manufacturing News,* had arranged with Ed Greer to share his room at the Royal York. Next day (Friday, Nov. 9) I lunched with the Maple Leafs at the Granite Club, Len Singer hosting. There, I met Eric—who, incidentally, presented me with a fine book on guns—and Walt Appleton, 1st Vice Ch'man who, it turned out, is an old Brown & Sharpe man with whom I enjoyed reminiscences about *auld acquaintance.* Also, Lyman (*yclept* Ike) Jardine, 2nd. Vice Ch'man, John Burk, Sec'y, and Jim McRae; with Ed Greer and myself, a double quartette *skoaling* the Dominion and the U.S.A.

Later, Len Singer drove me to Hamilton where, in the denuding Otis-Fenton plant, I did the heavy looking on while he appraised sundry machine tools. The boy knows his stuff! Then, to the Royal Connaught and the meeting, where the Hamiltonians vied in making my visit extremely pleasant.

Renewed acquaintance with John Walton, the while Ch'man Harry Whitehall introduced me to so many men that I'd have to be a politician to remember all. B. T. Anderson, of Sundstrand Machine Tool Co., Rockford, gave a fine talk on applied electronics but, perhaps due to some defect in the amplifier, was somewhat handicapped in putting it over. But y'know, the Canadians take their tool engineering seriously, many coming distances up to 60 miles to attend meetings. That's setting an example for us Yanks! The meeting over, Harry Whitehall invited me to spend the night at his home, in Galt, where I was entertained so royally that only stern duty prompted my departure. As I've said before, they're swell folks, the Canadians.

Back in town, was delighted by a visit from Bill Sherman, formerly Detroit editor for *Iron Age* and latterly doing a swell job with the Automotive Council for War Production. I'd rather hoped that we could entice Bill into our editorial fold, but he's acquired a yearning for the machine and tool field, where I'm sure he'll make his mark in a big way. However, we expect to add a good man to the staff before long (they're hard to get) when, with the work more equitably divided, we'll no doubt eliminate some of the bugs that creep into our pages now and then.

Y'know, a lot of fine things have been said about the Tool Engineers, and especially about the role they played in the late war production. But, nothing has been quite so complimentary as an article—"Men who make Dreams come True"—in the recent Pratt & Whitney publication, *Backgrounds*. The article is reprinted in this issue, with credit to the source and to the author, Pratt & Whitney's advertising manager E. C. (Ed) Shultz, who modestly refused a by-line in the original. You'll like this story, as well as several others in this issue.

In this connection, an article by John Hyler—Automatic Multiple Dip Pickling—brought up the name N. Ransohoff, Inc., Cincinnati, makers of the equipment described. And memory clicked back to '10, when I worked with young Nat Ransohoff, then fresh out of Sheffield—or was it M.I.T.?—at Pratt & Whitney's. We roomed at the old Farmington Hotel and, for diversion, would put on the gloves when Nat, being a cagey boxer, would protect his nose, thereby leaving me full play for his midriff. In return, he'd polish off the corners of my head; never would fit a square porthole after that. Now, Nat's prex of the company—i.e., of Ransohoff, Inc. Incidentally, I could name several people who will be interested in Mr. Hyler's article, which is scheduled to appear in this issue.

And now, the year drawing to a close, I extend to all our friends North, East, West, South our best wishes for a Merry Christmas and a Happy New Year. May '46 usher in a *New Era* of Peace on Earth and Good Will among Men.

Andy

GOOD READING

A Guide to Significant Books and Articles of Interest in the Trade Press

METAL SPINNING BY MODERN METHODS, an article by Edwin Weiss in November *Machinery* deals with one of the oldest arts in metal processing. Yet, its applications in modern industry are wide and varied, and new methods discussed are greatly widening the scope of metal spinning. The article is well presented and profusely illustrated.

DESIGN ANALYSIS OF MESSERSCHMITT ME-262 JET FIGHTER is part 2 of article by John Foster, Jr. in November *Aviation*. The article deals with the power plant, and is perhaps the first complete engineering study to be published on the jet power plant. In addition to fundamental principles of jet propulsion, the article reveals the design and production compromises made necessary by limitations of materials.

POWER HACK SAW BLADES FOR SAWING SEAMLESS STEEL TUBING, by William Gustafson in November *Screw Machine Engineering*, applies practical "know-how" to a phase of metal cutting which, so far, has lain largely in the field of theory. The article is well illustrated and deals with a subject concerning which comparatively little has been published to date.*

*See also "Cutting your Costs with the Hacksaw," by Frank T. Wruk in August *The Tool Engineer*.

ECONOMICS OF ARC WELDING, by Walter J. Brooking in November *Welding Journal*, is a very comprehensive article that correlates the relationship of a number of important factors common to all welding applications and which affect the cost of welded structures. Profusely illustrated, the article further covers control of these factors.

X-RAYS GOLDEN JUBILEE, by David Goodman in November *Metal Progress*, is a short but interesting resume covering 50 years of X-Ray development from the time that Wilhelm Konrad Roentgen, Danish physicist, established their existence and their application in modern science and industry.

PLANNING THE MATERIALS HANDLING EQUIPMENT FOR A NEW FACTORY, by Warren J. Maciver, in November *Canadian Machinery and Manufacturing News* is slanted directly at owners and operators of small and medium sized plants. Actually, it is a dual article, tied in with **BELT CONVEYORS** by the same author. With these, is a third article—**HANDLING FACILITIES BUILT INTO PLANT DESIGN IN TIRE PUMP DEPARTMENT,** the whole comprising a very comprehensive outline of modern materials handling.

STAINLESS STEEL—Manual No. 11—is an article by Edwin Laird Cady in December *Materials & Methods* (formerly Metals and Alloys). Inconsistencies in manufacturers' literature, and limited space which still precludes complete truths, tend to confuse workers in stainless steel. This manual tends to answer such questions as: How to buy stainless steels; how to select grades; what product design problems exist; how to obtain the "know-how"—and to use it for greater profit.

Also, in the same issue: **ZINC EXTRUSIONS ATTAIN COMMERCIAL STATUS,** by Herbert Chase. An article dealing with equipment employed at White Metal Rolling & Stamping Corp'n, Brooklyn, N.Y. Process, which is almost identical with that used for magnesium alloy, but altered, permits extrusion of conventional and special shaped bars. Machining and applications are treated in the article.

BULLETINS AND TRADE LITERATURE

Items briefed herein have been carefully selected for their interest and application. Unless otherwise stated, all are available, free, from the stated sources.

PRODUCTION PLANNING CARDS and **DATA SHEETS** of value to industrial executives and engineers are now available without charge from the **PLAN-O-MILL CORPORATION,** 1811 E. Eight Mile Road, Hazel Park, Mich. They are offered for use in reconversion, for expanded facilities or in new building plans. Designed to simplify the layout of production flow by providing scale machine models (¼" = 1'-0") which can be placed on the factory floor plan and arranged to meet particular production or space requirements, a set of three cards cover three different Plan-O-Mill models. Each card reproduces 8 to 12 plan views of the model, together with specifications of the machine, and can be cut out and used as individual units for planning efficient allocation of available space on the factory floor plan.

STITES TOOL CO., 1426 W. Third St., Cleveland 13, has issued a bulletin describing its line of cams and circular form tools for Brown & Sharpe Automatic Screw Machines.

A bulletin by **KM&H CORP'N,** Fort Wayne 2, Inc., describes the company's line of pneumatic fixtures for indexing, milling and other automatic and semi-automatic attachments.

Q-C ENGINEERING PRODUCTS, 2842 West Grand Blvd., Detroit 2, describes the Q-C 180° *Rectangular Index Table.* Construction details of the fixture, said to be chatterless, are clearly shown in the inside pages.

A Circular—No. 56—by the **WAHLSTROM TOOL DIVISION** of American Machine & Foundry Company, 5502 Second Ave., Brooklyn, N.Y., gives construction details, special applications, and complete size ranges on the well-known Wahlstrom Drill Chucks and Tapping Attachments.

A new book, *"Over 7000 Ways to Control Dimensions,"* has been released by **FEDERAL PRODUCTS CORPORATION,** Providence. This book, designed for desk or pocket use, contains 52 pages listing well over 100 representative *Dial Indicating Gages* which meet practically every inspection need involving dimensional control.

Bulletin No. 945, issued by **SIZE CONTROL CO.,** division of the American Machine & Gage Co., 4660 W. Fulton St., Chicago, describes the company's twin line of reversible GO and NO-GO thread and plug gages. These gages are designed for extended life.

The **AMERICAN ARBITRATION ASS'N,** 9 Rockefeller Plaza, N.Y. 20, has issued literature describing what the association is, how and where it functions and its activities and projects. It also issues a bi-monthly magazine.

The improved Model 860-C *internal gear finishing machine* which operates on the established "Michigan" crossed-axis gear shaping principle, is described and illustrated in a new technical bulletin No. 860-C-45, now available from **MICHIGAN TOOL COMPANY,** 7171 E. McNichols Road, Detroit 12.

A series of Quality Control Reports, in bulletin form, are said to be available from **CARNEGIE INST. OF TECHNOLOGY,** Pittsburgh 13. These reports cover *statistical* quality control in the manufacture of radios, ball bearings, the steel and aircraft industries as well as other industries. They are authoritatively written, and a very complete bibliography lists articles on this subject and their authors.

A bulletin by **POND ENGINEERING COMPANY,** 15 Park St., Springfield, Mass. describes the Pond *operating fixtures* that convert standard machines to automatics.

AA GAGE COMPANY, 350 Fair St., Detroit 20, has issued a new bulletin describing its line of cylindrical plug and ring gages, setting discs; also, describing gage salvage by Chromium plating.

A bulletin—*The Miller that uses its head*—by **W.H. NICHOLS & SONS,** Waltham 54, Mass., describes the high precision hand millers for which this form is noted. Also available, an 86 page Handbook of Nichols miller applications.

DEVLIEG MACHINE CO., 450 Fair Ave., Ferndale, (Mich.) 20, has issued an interesting Bulletin describing the new model 3-B DeVlieg Jigmil. This *boring and milling machine,* which introduces automatic positioning, is said to have accuracy "beyond human skill."

STANDARD MACHINERY COMPANY, Providence 7, R.I. has a new and very complete bulletin on Standard *Swaging Machines.* In addition to description of a complete line of swagers, the bulletin shows unusual applications.

A folder, by **ROLL AWAY SKATE CO.,** 4533 Payne Ave., Cleveland, describes the Rol-O-Way *Cutter Guard,* which shields a milling cutter and stops coolant spatter and flying chips.

A brochure on Vs-*Solid Fibre Boxes,* by **WEATHERPROOF SOLID FIBRE BOX GROUP,** 735 Eleventh Street, N.W., Washington 1, should be of interest to manufacturers required to ship packaged goods. Hundreds of millions of these boxes used during the war indicate extended use in peacetime.

BEAVER TOOL AND EGINEERING CORP'N., 2850 Rochester Road, R. 1, Royal Oak, Mich., has available a bulletin on Beaver *Solid Carbide Blade Face Mills.* Made with a positive rake of 15°, these cutters are said to provide greater flexibility, lower sharpening cost and larger tool life with less h.p. required.

SUNDSTRAND MACHINE TOOL COMPANY, Rockford, Ill., has issued a very comprehensive booklet on *Practical Milling Methods* which includes a great number of applications on widely diversified milling operations. Canadian tool engineers may apply to the Allison Machinery Company, Ltd. Toronto, Ont.

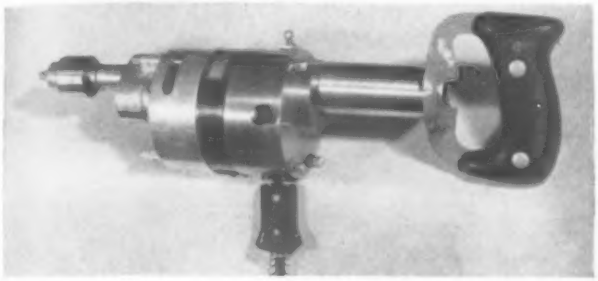
The Non-Ferrous Forging Digest, published monthly by the **BRASS FORGING ASSOCIATION,** 420 Lexington Ave., New York 17, N.Y., is just what the name implies—a digest of late forging techniques in the non-ferrous field. Each issue has information of interest to tool engineers.

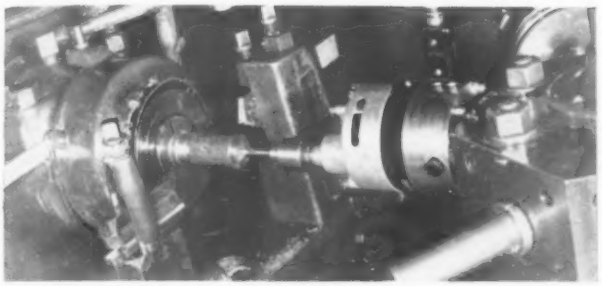
GADGETS

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

High Speed Drilling Attachment

THERE ARE numerous occasions on a Screw Machine or Turret Lathe, where the spindle speed is not high enough to successfully drill a small concentric hole. This device takes advantage of the spindle speed, plus the speed of the electric drill which is rotating in the opposite direction.





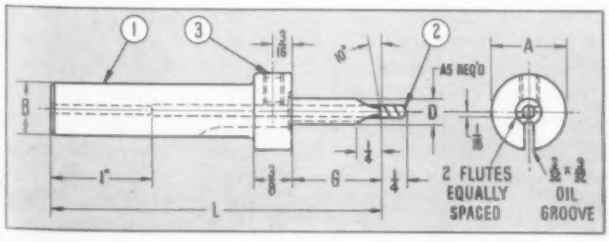
The conventional handle on the electric drill is removed, and a stud turned and fitted to the drill, and in line with the chuck. The shank is turned about ¼" smaller than the hole in the turret. A split bushing is made to centralize the chuck with the machine spindle, and the clamp in the Turret. When the turret is in position to drill, the cord is plugged in, and removed when the hole is drilled, before indexing the turret.

Walter Pohle,
Boston Chapter, A.S.T.E.

Drill-C' Bore Combination

WHILE THE combined drill and counterbore, shown, is simple enough in construction, it has saved about 100 percent in production time. The feature is that only a single spindle drill press is required for the two operations. Consequently, the operator needs only handle the workpiece once to drill and counterbore.

The tool can be made with an adjustable stop or as shown, in which Det. No. 1 is the holder, No. 2 the drill and No. 3 a cone point set screw with which to grip the drill. As constructed, the gaging distance G is maintained by grinding the face of the stop as the counterbore is ground. The drill, of course, can be extended to suit.

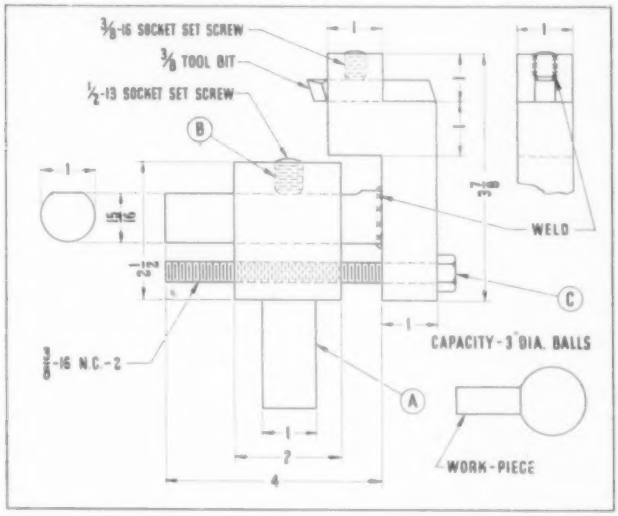


The counterbore (Diameter D) should be a slip fit in a standard drill bushing, without shape, and this guides the drill as well. Diameter A should suit the job, while B may be .500" even or of any suitable diameter. It may also be tapered to fit the spindle. C is the depth of hole for the drill, and a similar hole serves as a knockout, and L (overall length) should be proportionate to drill and counterbore diameters.

Frank J. Peragine,
Greater New York Chapter,
A.S.T.E.

Radius Cutter

THE ADJUSTABLE RADIUS CUTTER illustrated was designed for short run production of the balls for universal-ball-and-socket joints. It will cut balls up to 3" in diameter speedily and with complete accuracy. Practice is to rough turn the stock first in the lathe with a form tool, then transfer it to the milling machine for the finishing operation.



The shank (A) of the tool is gripped in the chuck of the index-head, mounted in a vertical position on the milling machine table. The workpiece is held in a chuck, mounted on an arbor which fits the tapered bore of the machine spindle. (Stock is in a horizontal position).

The set-screw (B) is loosened and feed-screw (C) is turned until the tool-bit starts taking a chip. The set-screw is then tightened, and a chip taken over the work by turning the crank of the index head. Where the quality of the finished product necessitates it, a small grinder can be mounted in place of the tool bit.

S.Sgt. R. E. Paquin
(Armer Forces)
Member A.S.T.E.

North East West South in Industry

THE BERT CARPENTER COMPANY, with offices at 208 Hanna Bldg., Birmingham, Mich., has been organized to serve as machine tool distributors for Michigan and Northern Ohio. Manufacturers now represented are Plan-O-Mill Corp'n, Hazel Park, Mich., and Reliance Hydraulic Press, Inc., New York City. Head of the new concern is **T. B. (Bert) Carpenter,** member of the original Board of Directors, A.S.T.E. and a past president of the Society.

Long prominent in the machine tool industry, Mr. Carpenter recently resigned as vice president and sales manager of the Wickman Corp'n. He was previously associated with the Nat'l Automatic Tool Company as sales engineer, Detroit and Chicago offices, and, until the outbreak of war, served as European representative in Paris. Associated with Mr. Carpenter are men thoroughly experienced in the sales of high production machinery and tooling, who, over a period of years, have been in continuous contact with the territory being served.

Manufacturing facilities in "practically every division" of the **WESTINGHOUSE ELECTRIC CORPORATION** "are being expanded to increase production from 40 to 90 per cent above pre-war-level," according to **A. W. Robertson,** Ch'man.

B. C. AMES COMPANY, Waltham, Mass. reports sharply increased demand for Ames precision bench lathes, millers and shapers.

L. D. T. Berg, for the past five years a sales engineer in **GENERAL ELECTRIC'S** Electric Welding Division, Schenectady, has been appointed welding specialist of the Company's Atlantic District with headquarters in Philadelphia.

The **CINCINNATI MILLING MACHINE COMPANY** has purchased the *Cincinnati Lathe & Tool Co.,* Oakley, O. A new firm, but using the old name, (Incorporated) will operate the plant as a subsidiary of Cincinnati Milling. Officers are Millard Romaine, pres., and E. W. Mueller, sec'y-treasurer. The firm will continue to manufacture "Cintilathes" in sizes 14 to 32 inch swing.

John Thompson, for the past 20 years Chief Engineer of **THE PIPE MACHINERY COMPANY** of Cleveland, Ohio has established residence in Phoenix, Arizona. He will act as sales representative for the gages, tools and oil country goods made by Pipe Machinery.

W. D. Turnbull has been appointed General Sales Manager of Kennametal, Inc., Latrobe, Pa. The appointment is in line with increased activity, by Kennametal, in the metal working field, and extended application in other fields, such as mining, petroleum and wood working. Improved tools have been developed for these industries.

Mr. Turnbull is a graduate electrical engineer, Penn State College, and has had more than 25 years of broad experience in engineering and sales in diversified industries. He holds the Westinghouse Electric Corporation's Award of Merit for outstanding work in these fields.

As announced by **Arvid Lundell,** president, **Ralph G. Lagerfeldt** (left) has been appointed vice-president and **Francis E. Pethick** (right) treasurer of **COLONIAL BROACH COMPANY,** Detroit. Both men have been with Colonial for some 15 years, with Mr. Lagerfeldt in complete charge of all sales activities connected with the company's line of broaches, broaching machines and hydraulic presses.

Prior to his promotion, Mr. Pethick was assistant treasurer of the company.

Carl W. Blade has been appointed carbide representative for the Firth-Sterling Steel Company in the southern and western Connecticut territory. Mr. Blade, who has been associated with the sale and use of sintered carbides for 16 years, will have his headquarters in Hartford, Conn.

Albert A. Leclere, proprietor of **PARAMOUNT ENGINEERING COMPANY,** announces the removal of the plant from 2985 East Jefferson Avenue to 1625 East Grand Boulevard. Paramount is engaged in the designing of tools, dies, jigs, fixtures, gages and special machines, as well as product engineering and wood patterns.

Clark W. King has been appointed Executive Assistant at Allegheny Ludlum Steep Corp'n, Breckenridge, Pa., according to Hiland G. Batcheller, president. Mr. King, who has extensive executive and administrative experience, came to A-L after several years served continuously as special assistant to each of the several Directors of the Division.

Appointment of **G. V. Woody** to succeed R. C. Newhouse as manager of the **ALLIS-CHALMERS** basic industries department, has been announced by W. C. Johnson, vice-president in charge of the company's general machinery division. Mr. Newhouse, who is retained as a consulting engineer, retires after more than 40 years of world renown as engineer, inventor and designer of some of the world's largest cement and mining machinery.

An increasing trend toward the use of Standardized Thread Milling Cutters is revealed by **DETROIT TAP & TOOL COMPANY,** Detroit. Although introduced only 2 years ago, primarily to simplify engineering and speed up delivery of the cutters most widely used in war production, the first three quarters of this year show an increase, in demand, of over 58 percent over the corresponding period in 1944.

E. L. Stacey, southern Texas representative for **FEDERAL PRODUCTS CORPORATION,** Providence, R.I., is now located in offices at 718 Leeland Ave., Houston 2. He will handle the Federal Metricator air gage, the Foote-Pierson electronic gage as well as the Federal line of dial indicators and gages.

Serving the Providence, R.I. district, **Wm. L. Burgoyne** has been appointed special field engineer. Mr. Burgoyne was previously connected with Wright Aeronautical Corp'n and the Sperry Gyroscope Co.

A.S.T.E. NEWS

NEWS OF INTEREST AND ABOUT MEMBERS

"NEW ERA EXPOSITION" THEME OF ASTE SHOW

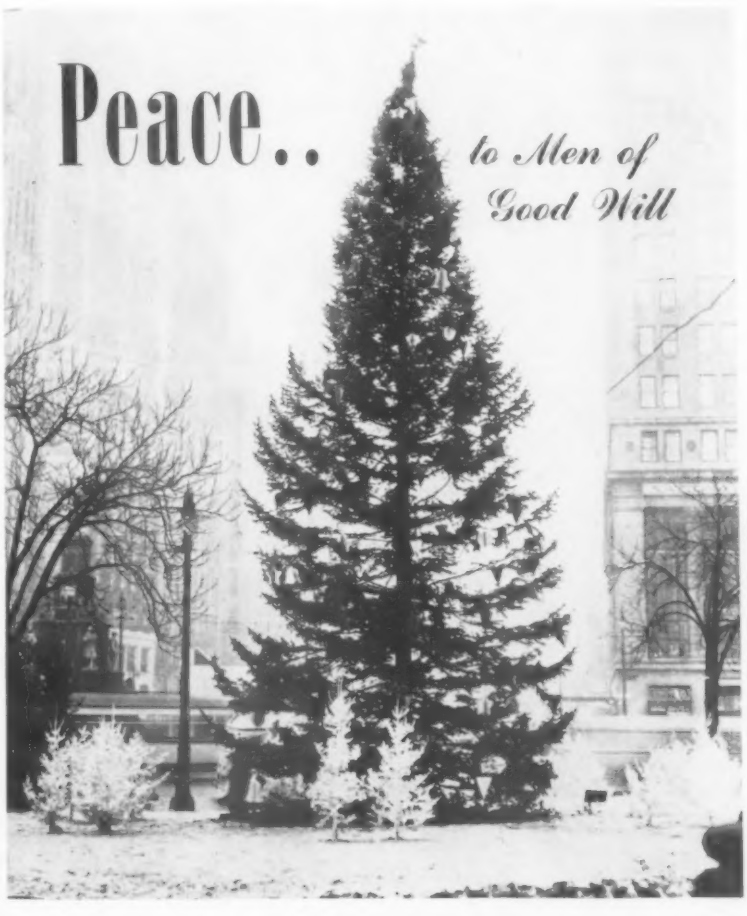
Technical Sessions and Plant Tours Planned

AMERICAN SOCIETY OF TOOL ENGINEERS NEW ERA EXPOSITION" is the name chosen for ASTE's first postwar exhibition of machine and cutting tools, materials handling and control equipment, and production processes, to be held in the Cleveland Public Auditorium, April 8-12. The Society feels that this name is significant in that the show will really usher in a new era of postwar industrial progress.

First ASTE exhibition since 1943, the New Era Exposition will be the fifth and largest collection of production equipment and processes to be sponsored by the organization. The entire quarter-million square feet of floor space in Cleveland's huge Auditorium is being reserved for the exhibition. At press time, exhibitors had made advance reservations for approximately one-third of this space, with additional requests pouring in daily. The complete floor plan of exhibit areas, showing the simplicity of arrangement and accessibility of each section, is available from American Society of Tool Engineers, 1666 Penobscot Building, Detroit 26, Michigan.

"This Exposition and the accompanying technical sessions have a very definite mission," President C. V. Briner asserted. "The re-dedication of industry to the pursuits of peace is a gigantic undertaking, and this concentration of the most important technical advances of the war years will present an unparalleled opportunity for study and interpretation in the light of civilian production requirements," he predicted.

(*Continued on Page 50*)



The photograph in this greeting shows the Detroit Municipal Christmas Tree, visible directly below the Society's Headquarters on the 16th floor of the Penobscot Building. Tree rises from the City Hall lawn on Woodward Avenue, facing Campus Martius and Cadillac Squares, where many busy downtown streets converge. Through this intersection flows more traffic than through New York's "Times Square."

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Society Names Conrad Executive Secretary

Detroit, Mich.—The appointment of Harry E. Conrad, as Executive Secretary of the American Society of Tool Engineers, on November 12th, brought into the organization a man with whom many of the members became acquainted in the war years when Mr. Conrad directed the activities of a number of production committees in the Automotive Council for War Production and the Central Aircraft Council.

H. E. Conrad

Mr. Conrad was born in Albion, Michigan, on March 2, 1902, and was educated in Albion public schools, Albion College, the University of Michigan, and Detroit College of Law. In 1926, he joined the sales-service department of the Cadillac Motor Car Division at Detroit, thus beginning eleven years of service in the General Motors Corporation. He served in the export division in New York City, as a District Manager of the Chevrolet Division in Tarrytown, and District Manager of the Pontiac Division in Buffalo.

In 1937, he became a partner in a management organization with headquarters in New York City and specialized in organizing distribution and merchandising methods for small industrial groups.

Early in 1942, just after the Automotive Council for War Production was organized by the automotive and allied industries to facilitate and expedite production for the nation's armed forces, Mr. Conrad returned to Detroit to join the staff of that organization and become manager of its War Products Division. In that capacity he organized and directed the activities of the several committees of production engineers, whose voluntarily co-operative efforts enabled the automotive industry to turn out approximately one-sixth of the nation's total production of arms and materiel for World War II.

In 1943, when the Central Aircraft Council was organized at the recommendation of Army Air Force officials and the aircraft engine and airframes committees of the Automotive Council became the nucleus of the newly-created group, Mr. Conrad was appointed manager of the organization. He served in that capacity until the Council was officially disbanded at the end of the war.

His hobby, farming, he shares with Mrs. Conrad and their sixteen-year old son, John, on the rolling, wooded acres near Holly, Michigan, that have been their home in recent years.

(*Continued from page 49*)

Admittance to the show will be by pass and will be limited to those who are true patrons of industry. Denial of admission to the general public, and installation of an unique registration system, gives assurance that the exhibition will not be cluttered with idle curiosity seekers. Notwithstanding these restrictions, more than 100,000 visitors are expected. Exposition hours will be from 9:00 A.M. to 6:00 P.M. daily.

Prior to the opening of the Exposition, the newly-instituted House of Delegates will assemble April 6 for the first time, to elect the 1946-47 Board of Directors. On the 7th, the incumbent Board will hold its Annual Meeting. Concurrently with the exhibition, a series of technical sessions will be conducted under the general direction of National Program Chairman H. D. Hall.

Present appointments to his committee include: W. B. McClellan, First Vice-Chairman, Detroit Chapter; R. W. Ford of Pittsburgh Chapter; F. J. Schmitt, Second Vice-Chairman, Chicago Chapter; Past Chairman H. E. Linsley and Education Chairman E. R. Murphy, Northern New Jersey Chapter; National Education Chairman O. W. Winter, National Director W. J. Gamble, J. I. Karash, Chairman, Cleveland Chapter; and Stephen Urban, Past Chairman, Syracuse Chapter. Others will be named as the program develops.

This group is meeting in Cleveland December 15 and 16 to complete arrangements for a schedule of timely technical symposia. Sessions will be fewer than usual, with emphasis on high caliber in both speakers and material to be presented.

Tentatively the program calls for technical meetings from 2-4:30 P.M. and from 8-10:30 P.M. on Monday and Tuesday, April 8 and 9. On Wednesday, there will be an evening session, followed by afternoon programs the next two days. The Annual Dinner and National Membership Meeting will take place Thursday evening, April 11.

Students from technical schools will be permitted to attend the sessions by invitation and appointment. Regularly-scheduled motion pictures will be shown in a separate building.

During the five-day Exposition, one tour will be made through each of the plants selected for visitation. Time and place of each of these inspection trips will be announced well in advance of the show. This will enable visitors to make hotel reservations accordingly, so that housing accommodations may be utilized to the greatest advantage.

Old Cutters Reclaimed For Postwar Use

York, Pa.—October meeting of Central Pennsylvania Chapter was held on the 9th in the Engineering Society Hall, with Larry W. Lang of the National Tool Salvage Company, Detroit, as technical speaker.

L. W. Lang

In discussing "Salvage Discarded Cutters," Mr. Lang described methods of reclaiming for postwar work cutters formerly used in war production, including recutting by grinding methods and tipping high speed cutters with tungsten carbide and other alloys.

A set of 35 slides was used to illustrate the process of gaining the maximum useful life from the various types of perishable metal cutting tools in common use. The ensuing discussion period revealed an active interest in the subject generally, and in the care of multi-diameter tools particularly.

There were visitors in the audience from both Philadelphia and New York. A buffet lunch was served.

Standards Committee Membership Increased

Several new appointees, recently added to the membership of the National Standards Committee, will assist in the extended activities of this group, Standards Chairman W. H. Smila has announced.

One of the new committeemen, W. F. Wagner, is a Past President of the Society and a recognized leader in the automotive field, who has been associated with the Lincoln Motor Company for many years. Mr. Wagner was Asst. General Superintendent of the Ford Willow Run Bomber Plant during its span of activity. Another member, E. J. Marasko, Chairman of the Cleveland Chapter Standards Committee, has always been keenly interested in standards and standardization. It is felt that he will be a valuable addition to the Committee.

The newly-organized Data Sheet Sub-Committee of the Standards Committee, under the leadership of Grant S. Wilcox, Jr., as Chairman, is energetically at work devising a suitable index for the Society's data sheets. His Committee is also engaged in reviewing submitted "copy" for inclusion in the Data Sheet Distribution Service. Dummy proofs, received from Chapter Standards Chairmen who have been assigned to contact manufacturers in their respective areas, are being processed and returned without delay.

G. S. Wilcox, Jr.

E. J. Marasko

W. F. Wagner

W. H. Smila

Data sheet distribution was temporarily suspended, pending the completion of the recent survey of the membership. The Committee expects to resume this service early next year.

John H. Schultheis, of the National Headquarters staff, serves as Secretary to the Standards Committee, as Frank W. Wilson, the Committee's Secretary, found it necessary to relinquish this office in order to devote his entire time to the editing of the "Tool Engineers' Handbook."

Chairman Smila has established the first Wednesday of each month as the Committee's regular meeting date. Members of the Society who are interested in standards are invited to attend these meetings which are held at 7:30 P.M. in the National Office at Detroit.

GI Wants Co-operative Course In Tool Engineering Approves Indexing Of Data Sheets

Wright Field, Dayton, Ohio—A co-operative tool engineering course combining practical work in a factory with theoretical classroom instruction in school is considered the ideal college curriculum by Pfc. William O. Yeazell, a Dayton Chapter armed service member. Pfc. Yeazell, who plans to continue his education when he is released from the Army Air Forces, says:

W. O. Yeazell

"Next year I propose to resume my work for mechanical and industrial engineering degrees, to be followed by a business administration course for the master's degree. It is my belief that the tool engineer needs as much if not more training than any of the other branches of the profession. For this reason, I am inclined to question the value of the 'quickie' courses being offered or proposed by some of the universities, when taken by themselves.

"The need for practical experience among tool engineers is, of course, even greater. In my opinion, this would indicate a co-operative course with a splendid program of practical industrial work in the factory and theoretical classroom instruction in the school. A higher than usual degree of co-ordination should be achieved, and all instructors should have a thorough understanding of the industrial aspect which is the real goal.

Commenting on the Society's engineering data sheets, Mr. Yeazell declared, "I do not believe that the need for a practical working index can be overemphasized. The sheets should be cross-indexed by subject and by manufacturer. I think that the present form of the sheets themselves is most satisfactory, but it is hard to find desired information. Also every effort should be made to have each manufacturer of the various items represented, giving the user of the sheets a comparison of the several makes. Of course, that is a rather large order, but it is needed if the most benefit is to be derived from the use of the sheets. In connection with this, it might be suggested that the Society publish a list of the manufacturers of the more commonly-used articles and materials needed for this work.

ASTE'er Yeazell concurred with the membership and industry when he remarked, "I'm looking forward to the publication of the 'Tool Engineers' Handbook' with great anticipation, for I believe that it will fill a need all too familiar with any tool engineer."

He indicated his appreciation of the Society's service to its armed service members, saying, "THE TOOL ENGINEER has certainly been a tremendous help to those of us who have had no other contact with the doings of the profession—possibly even more than when we were more active in the work."

His two years in the service Pfc. Yeazell reviews laconically, relating:

"I entered active duty in November of 1943 as an Aviation Cadet. I was washed out, grounded and disqualified for overseas duty almost immediately because of an interesting but inconvenient habit of gaily passing out in the middle of proceedings. After several miscellaneous transfers, I arrived at Maxwell Field, Alabama, where I was eventually placed in charge of engineering drawing and design in connection with B-24 and B-29 maintenance, together with a number of the many odds and ends of related work which crop up around a field.

"From there I was sent to Bolling Field, Washington, D.C., to do logistics work in conection with aircraft maintenance. For the past six months, I have been here at Wright Field, on experimental and procurement work."

A former tool engineer at Waco Aircraft Company, Troy, Ohio, Mr. Yeazell expects to return to civilian life soon.

Ladies Night Program Features Philosopher

Detroit, Mich.—"How to Be Happy Though Educated" was explained by Charles Milton Newcomb, M.A., in a philosophical and often humorous manner, when he appeared before Detroit Chapter's Semi-Annual Ladies Night, held November 8 in the Engineering Society auditorium.

Mr. Newcomb's presentation dealt with present-day political and economic conditions, offering a constructive philosophy of life. He defined the basic laws of life, a knowledge of which constitutes true education, as compared with the false "education" which made possible the breakdown of civilization in the recently-concluded world conflict.

A former head of the Department of Public Speaking in a large university, Mr. Newcomb has served as Executive Secretary of the Industrial Association of Cleveland in one of the original attempts to promote better employer and employee relationships in industry

An audience of 850 heard Mr. Newcomb's lecture. Prior to the meeting, dinner was served in the banquet hall to 540 members and their feminine guests.

Coming Meetings

ALL CHAPTERS—January. Election of Chapter Nominating Committees to present names of candidates for representatives to the House of Delegates and for Chapter Officers.

CHICAGO—January 7, Huyler's Restaurant. Dinner, 6:30 P.M. Speaker: Dr. Hilton Ira Jones, Managing Director, Hizone Laboratories, Wilmette, Ill. Subject: "Peeps at Things to Come."

DETROIT—January 10. Consideration of nominees for Board of Directors. Discussion of the provisions of the new Constitution and By-Laws. Technical session to be announced.

HARTFORD—January 7. Speaker: Z. C. Van Schwartz, Chief, Machinery Development and Research, Peck, Stow and Wilcox Co., Southington, Conn. Subject: "High Speed and High Cycle Milling Through the War's Tool Engineering."

NEW HAVEN—January 10, Chi Psi House. Dinner, 6:30 P.M. Speaker: M. W. Reid, Supt., Tool Section, General Electric Co., Bridgeport, Conn. Subject: "Production Tools, Their Design and Use."

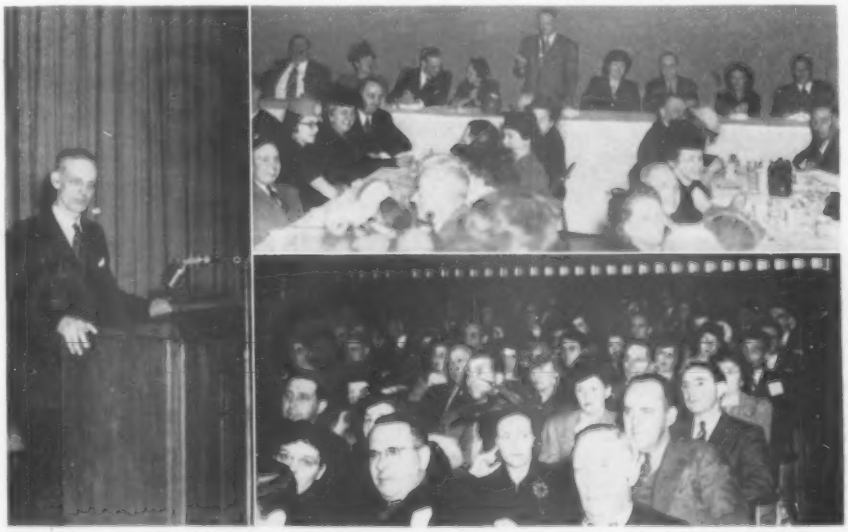
NEW ORLEANS—January 8. Speaker: Arthur M. Swigert. Subject: "Super-Finish."

NEW YORK, GREATER—December 17, Hotel New Yorker. Dinner, 6:30 P.M. Speaker from Sheffield Corp., Dayton, Ohio. Subject: "Crush Dressing of Multi-Form Wheels."

SYRACUSE—January 15, Hiawatha Room, Onondaga Hotel, 8:00 P.M. Past Chairmen's Night. An ASTE National Officer will be guest speaker.

TOLEDO—January 9, Toledo Yacht Club. Speaker: A. H. Diemel, Spicer Mfg. Corp. Subject: "Hydraulic Transmission." Discussion of Shot Peening by J. C. Straub and H. F. Moore, American Foundry Co.

TORONTO—January 14, Malloney's Art Gallery. Dinner, 6:30 P.M. Speaker on "Crush Form Grinding" from Thompson Grinder Co., Springfield, O.



In photo at left Charles Milton Newcomb tells Detroit Chapter and their ladies "How to Be Happy Though Educated." Mr. Newcomb was guest speaker at the Chapter's November 8 Ladies Night program. Top right: Head table guests include (left to right) First Vice-Chairman and Mrs. W. B. McClellan, Mr. Newcomb, the speaker; Chairman and Mrs. Wayne Kay, Past Chairman and Mrs. Grant Wilcox and Second Vice-Chairman and Mrs. John W. Allmon. Bottom, right, shows a section of the audience listening to Mr. Newcomb.

Rhode Island ASTE'ers Advise On Setup Of Providence Technical Institute

Providence, R.I.—A Trade School and Technical Training Institute has been established by the Providence Department of Education, with the assistance of the Education Committee of Little Rhody Chapter, ASTE.

The Committee was invited to serve in an advisory capacity in setting up the courses of study for the engineering curricula. Their objective is the teaching of proper subject matter from adequate textbooks, that students may receive practical training for industry.

Personnel of the Committee, chairmanned by Robert B. Parker, owner of Parker Engineering Company, includes Edward J. Berry, owner of Berry Engineering Service and a National Director of ASTE; Lawrence H. Cook, President, Lawrence H. Cook, Inc., and owner of Johnson Tool Company; Henry E. Owens, Factory Manager, Henry Owens & Company; Thomas Ponton, General Manager, Hammel-Dahl Company; and Lloyd Sheeran, owner, Rhode Island Task Engineering Company. As the group is evenly divided between shop operators and engineers, their combined knowledge assures the selection of practical subjects for the mechanical drawing and toolmaking courses.

Courses Scientific

These courses are intensive and are essentially terminal rather than preparatory. They are based on principles of science, require the use of mathematics beyond high school, and emphasize rational processes rather than rules of practice.

The Mechanical Drafting course includes drafting, mechanics, industrial economics, measurement standards, machine skill, electricity, pattern making and foundry practices. After graduation opportunities for the trained draftsman are quite numerous. Many designing engineers, mechanical shop superintendents and production superintendents have begun their careers as draftsmen.

Program for the first year consists of Review Mathematics, 40 (hours); Mechanics, 160; Drafting, 400; English, 160; Industrial Economics, 160; Measurement Standards, 80; and Machine Shop, 400. Second year subjects include Mechanics, 200; Electricity, 160; Metallurgy, 160; Drafting, 600; Time Study, 80; Pattern Making, 160; and Foundry, 40. The entire course constitutes 2800 hours in Vocational Major, Related Vocational, and Academic subjects.

In the Toolmaking course the student learns to construct jigs, fixtures, cutting tools, and dies from the rough material to the finished product, including all the processes of laying out, turning, shaping, milling, grinding, and hardening. Completion of this course enables the student to enter the trade as an advanced apprentice with opportunities available to enable him to eventually become a full-fledged toolmaker.

Well-Balanced Curriculum

First-year students must complete the following schedule: Review Mathematics, 40 (hours); Mechanics, 200; English, 80; Drafting, 232; Shop, 768; and Industrial Economics, 80. Second-year requirements are: Mechanics, 200; Metallurgy, 160; English, 80; Industrial Economics, 80; Mechanical Drafting, 160, and Shop, 760.

An outline of the subjects composing the Mechanical Drafting and Toolmaking courses follows:

ENGLISH—Review of parts of speech; vocabulary and word study; practice in letter writing and reports; special emphasis on details in reply to letters of inquiry; writing specifications; reading for comprehension; professional and technical magazines and reports.

INDUSTRIAL ECONOMICS—Study of the background of industry; the evolution and growth of industrial enterprises; division of labor; principles of organization; industrial relations; economic and social aspects; recent social legislation; review of American democracy and constitution.

REVIEW MATHEMATICS—Review of previous work in algebra, trigonometry, logarithms; interpretation of charts and graphs; and use of slide rule.

L. H. Cook

H. E. Owens

Lloyd Sheeran

R. B. Parker

E. J. Berry

Thomas Ponton

Mechanics a Major Subject

MECHANICS—An extensive course given one hour each day throughout the entire course. Knowledge of the fundamental laws of science and their application to practical situations. Review of physics and elementary chemistry; forces, energy and work, statics, graphic solutions, stress and strain, strength of materials, safe loads, and the general field of structural mechanics. The various technical and professional handbooks will be employed in the course and instruction will be directed toward facility in their use.

MECHANICAL DRAFTING—The objective is to develop such judgment and ability as will enable the student to make practical working drawings speedily and accurately in accordance with modern drafting room practice. Work covers lettering, freehand and instrument drawing, detailing of machine parts and assemblies, standard machine fastenings, tracing, intersections and developments, power transmission, miscellaneous mechanical movements, and devices through which interchangeability of parts in manufacturing is accomplished.

DRAFTING FOR TOOLMAKERS—To develop skill in drafting practice and shop sketching in order to interpret manufacturing directions from working drawings, and also to develop and present ideas by intelligent sketches.

ELECTRICITY—A modified course in electricity offered to students taking mechanical drafting.

Hand and Machine Tools Used

TOOLMAKING—Work in the machine shops for toolmakers involves the use of both hand and machine tools after a foundation course in the techniques of handling lathes, milling machines, shapers, drill presses and grinders. The course provides a variety of shop exercises in the making of various tools, dies, jigs, and fixtures. The principal objective of the course is to develop a knowledge of tool and die making and as high a degree of manual skill as time allows.

TIME STUDY—The purpose of this course is to give the student some training in production and operation analysis. Time and motion study is an important part of this work, as it may be a contributing factor affecting the design of equipment.

METALLURGY—An introductory course dealing with a study of the properties and grades of steel and their uses. Topics include iron and its alloys with carbon, the manufacture of iron and iron carbon alloys, wrought iron and steel from pig iron, properties of plain carbon steel, alloy steels; the manufacture of tool steel, properties of tool steel, alloying elements; the "Carpenter" matched set method of selecting tool steel, heat treating methods and equipment; properties and heat treatment, and the relation of design to heat treatment.

Measuring Methods Taught

MEASUREMENT STANDARDS—This is a combined shop and theory course planned to give students in mechanical drafting an understanding of and practice in the use of precision instruments, such as micrometers, verniers, size block and optical flats, also the types of gauges and devices which are used to control dimensions of manufactured products to established limits.

MACHINE SHOP—This course is planned especially for students taking the mechanical drafting course, in order that they may acquire an understanding of fundamental machine operations. The course involves the use of both hand and machine tools because of their universal use in modern production.

FOUNDRY AND PATTERN MAKING—Study of the principles and practice relating to castings of gray iron, malleable iron, steel, bronze, and other alloys. Some time is devoted to the design, construction, and use of wood patterns required in the casting of metals. Consideration is given to the use of core boxes and core making. Inspection trips to foundries supplement class work.

Purpose of the Institute, which the local ASTE Chapter assisted in organizing, is to furnish advanced technical training and education to those who do not have the time to devote to a full college course. In addition to the engineering programs, courses are being offered in Industrial Electricity, Architectural Construction, and Printing.

Large Turnout Hears Die Design Expert

Peoria, Ill.—High enthusiasm for the subject of die design and deep drawing was evidenced in the attendance of 144 members and guests attracted to the October 2 meeting of Peoria Chapter, featuring this topic.

The technical session, "The Flow of Metal Under the Action of Drawing Dies," was conducted by C. A. Gray, Superintendent, Die Department, E. W. Bliss Company, Toledo, Ohio. Mr. Gray's 35 years of experience in the die and press field makes him well qualified to discuss this controversial subject.

Preceding the technical session, ASTEe'r W. Z. Fidler, Chief Tool Designer for the Reynolds Engineering Company, Rock Island, entertained with his collection of puzzles made of wire, wood, sheet metal, and other materials. His display and demonstration of some 250 puzzles made an excellent coffee chat. Added amusement was provided in the members' efforts to solve some of the puzzles.

The dinner was held in the American Legion Hall.

* * *

At the previous meeting Walter F. Craig, Contact Metallurgist, Carnegie-Illinois Steel Corporation, Chicago, spoke on "The Making and Shaping of Steel." His lecture was supplemented with a technical film, telling the complete story of steel in all its major phases from the time the raw ore, coal and limestone are taken from the ground until the finished product in its many forms leaves the mill.

C. A. Gray (center) of E. W. Bliss Company, Toledo, using a quarter-size bathtub as a model, explains dies necessary and method of manufacture. Mr. Gray was speaker at October 2 meeting of Peoria Chapter. Interested observers are (left) Program Chairman W. M. Owen and (right) Technical Chairman Walter Brooking.

Metal Stamping Symposium

Fond du Lac, Wis.—Three speakers participated in the technical session conducted during the October 12 meeting of Fond du Lac Chapter, in the Hotel Athearn, Oshkosh. They were Lester Birbaum, Superintendent; William Sievert, Master Mechanic; and Ray Buettner, Chief Engineer, Milwaukee Stamping Company.

The program was devoted to a discusssion of metal stampings, the speakers illustrating their presentation with charts, samples of work and a sample die.

More than 100 members and guests were present in addition to visitors from New York, Detroit and Chicago. Mr. Guillermo Hasbach of Mexico City, who is spending a few weeks at Giddings & Lewis Machine Tool Co., spoke briefly giving his impressions of Wisconsin.

Tooth Design Important In Surface Broaching

Pontiac, Mich.—Members of Pontiac Chapter met October 18 at the Roosevelt Hotel to hear George Squibb of the Cincinnati Milling Machine Company discuss "Surface Broaching, Theory and Practice."

George Squibb

The design of the broach tooth is very important to good results in surface broaching, Mr. Squibb emphasized. He also stressed the necessity of calculating very closely the chip gullet and clearance angles in order to obtain proper finish and broach life. Tool life per edge is greater than on milling cutters, he claimed. Broaching also has the advantage of producing a flat surface in contrast to the scalloped surface that sometimes results from using a milling cutter, the speaker pointed out.

He indicated that with surface broaching 1 to 70 f.p.m. is possible, when variable ram speed machines are used. Mr. Squibb used slides for illustration.

David Livingstone of the G.M.C. Truck and Coach Division read a paper entitled "Progress of Honing," and Albert Barnett, a veteran, showed war films of Europe and the South Pacific.

* * *

At the previous meeting W. J. Mirgeler of Kearney & Trecker Corporation, Milwaukee, spoke on "Carbide Steel Milling." Mr. Mirgeler's talk was augmented by a color film demonstrating the milling of steel with carbides.

W. J. Mirgeler

A Navy film, showing the capture of a German submarine, was also enjoyed by the audience of 94 members and guests who attended the dinner meeting in the Pontiac Hotel.

Film Shows Twist Drills—Uses And Abuses

Richmond, Ind.—E. D. Kimmel of the Cleveland Twist Drill Company showed Richmond Chapter an informative sound film, "Twist Drills—Their Uses and Abuses," when the group met November 13 at the Leland Hotel. The production contrasted the consequences resulting from incorrect grinding of drills, with the correct methods of grinding for drilling various materials.

Mr. Kimmel's knowledge of his subject was apparent in his answers to questions from the many engineers connected with the drilling industry. Each person in the audience received a souvenir package containing a drill gage, a leather notebook, and a Handbook for Drillers, with the compliments of Mr. Kimmel's company.

Lester Meadows, City Clerk of Richmond and an ardent advocate of conservation, was the coffee speaker, Mr. Meadows spoke on the proposed new Indiana State Park.

Eighty-five members and guests attended the dinner meeting.

Reports Present Status Of High Speed Steel

Washington, D.C.—An outstanding technical session was presented by Potomac Chapter, October 4 at the Hotel 2400, when W. H. Wells, Metallurgical Engineer for Tool Steels, Allegheny Ludlum Steel Company, Brackenridge, Pennsylvania, lectured on the development of high speed steels. The speaker laid special emphasis on tungsten-molybdenum high speed steel, in his illustrated talk.

A sound film in color showed the manufacture of lamination dies from high carbon and high chrome tool steels. This film is an Allegheny Ludlum production.

Following the technical session, motion pictures of concentration camps in Germany were screened through the courtesy of the War Department.

One hundred members and guests attended the dinner and technical session.

Potomac Chapter was host to W. H. Wells of Allegheny Ludlum Steel Company at the Chapter's October meeting. Mr. Wells spoke on "High Speed Steels." Left to right are Lawrence Didzoneit, Potomac Chapter Chairman; Mr. Wells, and ASTE'er W. A. Mace of Allegheny-Ludlum, who arranged for the meeting.

Modern Tooling For Production

Cleveland, Ohio—A remarkable demonstration of modern methods of tooling multiple spindle bar and chucking machines for higher production was given Cleveland Tool Engineers at their November 9 meeting in the Cleveland Engineering Society Building.

Robert R. Rhodehamel, General Sales Manager of National Acme Company, delivered the slide-illustrated talk at the technical session which was attended by approximately 150 members of Cleveland Chapter. In describing the tooling for some of these unusual jobs, Mr. Rhodehamel displayed his wide knowledge of his subject. The discussion period which followed his talk indicated the keen interest of his audience.

The coffee speaker of the evening was Mr. George H. Hufferd, Chief Engineer of the Weatherhead Company. Mr. Hufferd was a member of a three-man group assigned by the United State Army Air Corps to make a survey of German industrial facilities.

His subject, "A Forty-Five Day Trip Through Industrial Germany," utilized to the fullest extent his keen powers of observation in his description of the people, industries and scenes of devastation in the territory through which his party traveled. His comments left no doubt in the minds of his listeners that victory in warfare consists of more than winning battles, because of the psychological effect on the conquered people.

From an engineering standpoint, Mr. Hufferd's talk presented a clear picture of the actual effects of the war on Germany's industrial activities.

Hard-Facing Materials—Selection And Methods

Minneapolis, Minn.—J. A. Gallaher's talk, "The Selection of Hard-Facing Materials and Methods," was a "must hear" subject as evidenced by the large attendance at the November 14 meeting of Twin City Chapter, which featured Mr. Gallaher as technical speaker.

As an introduction to his address, Mr. Gallaher, who is District Manager of the Haynes Stellite Company of Chicago, listed the five types of hard-facing materials that were to be considered. Subsequent reference to these metals was made by their respective type numbers, each having its own chemical characteristic and alloying elements. The proper type or combination of types is dependent upon the user's specific requirements, the speaker stated.

After selection of the correct hard-facing material, four points should be considered: 1.—mechanism of wear (i.e.—impact, abrasion, thermoshock, chemical, and so forth); 2.—base material; 3.—preparation of the base material prior to surfacing; and 4.—application of hard surface material (oxyacetylene or electric arc).

Slides were used to illustrate a number of applications where surfaces subjected to intensive wear or corrosive action could be hard-faced. A two-fold purpose was accomplished in several instances—that of reclaiming wornout equipment and at the same time obtaining a surface which would have from six to as high as 25 times the wear-resisting qualities of the standard materials—carbon tool steel and special alloy steels.

The demonstration showed that the faced material can be readily machined after welding, with tungsten carbide tools, at approximately 25 to 40 surface feet per minute. When surfacing thin sections, warpage and cracking can be overcome by holding the blade at a reverse bend while welding. This procedure results in compression rather than tension in the facing material, with the part returning to a flat position.

Mr. Gallaher confined the latter part of his talk to a discussion of precision casting of alloy materials for corrosion, abrasions and heat applications. This process effects almost complete elimination of machining operations in the production of small and intricate parts from non-ferrous metals. Sample castings of small alloy blades or buckets used in turbo-superchargers were displayed. The "lost wax" or investment casting method employed to produce these parts, as explained by Mr. Gallaher during the question and answer period, proved most interesting and educational.

A brief business meeting preceded the technical session, with George W. Wise giving an excellent report of the Society's Semi-Annual Meeting in Detroit.

In upper left photo, grinding with a crush dressed, multi-formed wheel receives individual attention of interested group of Dayton Chapter members who participated in recent Chapter tour of the Sheffield Corporation's plant. Upper right: Harry Rausch, Gage Division Superintendent, demonstrates how a Multichek works. Lower left: Art Homer, Asst. Superintendent, Gage Division, explains tooling for boring A.G.D. snap gages. Lower right: Jack Miller of Machine Tool Sales (last man on right) explains function of the Micro-Form grinder.

Sheffield Host At Plant Tour

Dayton, Ohio—One hundred and twenty-five members of Dayton Chapter recently made their first organized plant visitation at the Sheffield Corporation, convening in the cafeteria where a buffet dinner was served.

A short program was conducted in the cafeteria with W. I. Wilt, Asst. Sales Manager, acting as chairman for the Sheffield group. Following Mr. Wilt's welcome to the ASTE'ers, George Tillotson, Chairman of Dayton Chapter, presided over a brief business session.

Ralph E. Lilleberg, Second Vice-Chairman of the Chapter and Gage Manager for Sheffield, gave a brief resume of the program and the points of interest to be seen on the inspection tour. He also explained how Sheffield is using various types of gages, such as Precisionaires, visual gages, and dial indicator snaps, to measure the product while it is in process at the machine. He pointed out the economy resulting from the use of gages in this manner.

Carl Linxweiler, Manager of Machine Tool Sales, gave a brief talk on the importance of reducing production costs by grinding with a crush dressed, multi-ribbed wheel, detailing these operations as performed in the plant.

R. Y. Moss, Sales Engineer, then described the processing and tooling in connection with the manufacture of thread roll-snap gages. Examples of special tooling for limited production runs found in gage manufacturing were also discussed.

The Chapter members were then divided into small groups and taken on a planned tour of the plant to view various tooling setups, thread and form grinding operations, and other machine operations where gages are used to measure at the machine.

Quality Control Engineer Demonstrates Applications

Syracuse, N.Y. — "How Successful Tool Engineers Use Quality Control" was explained by Richard W. Coolbaugh, speaker at the November meeting of Syracuse Chapter, held in the Onondaga Hotel on the 13th. Mr. Coolbaugh is Asst. Chief Inspector of the Easy Washing Machine Corporation.

The speaker's splendid talk was illustrated with graphic blackboard charts, clearly demonstrating every phase of his subject.

Mr. Coolbaugh is nationally-known in the field of quality control as a member of the Executive Board of National Quality Control Engineers and of the Editorial Board of NATIONAL QUALITY CONTROL MAGAZINE, President, Syracuse Chapter, Quality Control Engineers; and instructor in Industrial Statistics and Quality Control at Syracuse University.

* * *

Creighton Audette of the Cone Automatic Machine Company, Windsor, Vermont, spoke on "Mass Production of Cone Automatics" at the Chapter's October 9 meeting in the Danville Hotel, Auburn.

After tracing the history of the screw machine, Mr. Audette displayed samples of work done, and screened a film showing the machine in operation.

Richard W. Coolbaugh (left) of the Easy Washing Machine Corporation shows, with blackboard chart, that approximately 30% of micrometer users read them accurately, the remainder making errors as high as .050". Mr. Coolbaugh spoke on Quality Control at November 13 meeting of Syracuse Chapter. Dinner table groups at the meeting are shown in the center and right photos.

F. H. Taub (left) and J. H. Quick of Industrial Engineering Department, RCA Camden Plant, tell Cleveland Chapter members (right) that mass production techniques increase employment. In their presentation, "Tool Designing For Production," before a recent meeting of the Chapter, the speakers discussed applications of the principles of motion economy.

Magnesium Would Build Road To Moon

Grand Rapids, Mich.—A road to the moon 125 miles wide and 10 feet thick could be built from the magnesium known to be in the sea, Western Michigan Chapter learned from A. M. Lennie, Development Engineer for Dow Chemical Company, Midland, Michigan, and speaker at the Chapter's November 12 meeting in the Rowe Hotel.

Mr. Lennie's treatise, on the development of magnesium, its properties, uses and advantages, was entitled, "Magnesium and Its Application in Modern Industry." A well-informed speaker, Mr. Lennie's references to machining, forming and forging of the new, light-weight metal were intensely interesting to the engineers present.

At the conclusion of his address, Mr. Lennie displayed magnesium samples and presented a sound film, "The Working of Magnesium."

Rubber Developments Seen In Film

Rockford, Ill.—J. A. Armour of The B. F. Goodrich Company, Akron, Ohio, gave a short talk and showed a technicolor film on "How Industry Uses Rubber," at the November 1 meeting held by Rockford Area Chapter in the Hotel Faust.

This film showed some of the newest developments in synthetic rubbers such as "Koroseal" and "Ameripol."

Motion pictures of the Alcan Highway concluded the program.

WPB Official Explains Surplus Sales Procedure

Hartford, Conn.—November meeting of Hartford Chapter was held on the 5th, with dinner at the City Club preceding the technical session held in the Hartford Gas Company Auditorium.

Approximately 75 people attended the dinner at which William Hartigan, Financial Editor of THE HARTFORD TIMES, was the coffee speaker. He outlined the postwar prospects for Connecticut industry. His remarks were based upon his recent visits to 12 of the leading plants in the state. In summarizing, he indicated that Connecticut manufacturers should play a leading part in postwar industry.

Principal speaker of the evening was Harold Bates of the War Production Board, who discussed the disposition of surplus tools and machinery. Mr. Bates explained how any interested person could apply for and procure the tools and machines he requires. He also outlined the wartime activities of his office.

Many of the 140 members and guests present took advantage of the subsequent discussion period to ask the speaker specific questions concerning the purchase of surplus goods.

Ashley Leaves Ex-Cell-O

New York City—G. E. Ashley, of Northern New Jersey Chapter, ASTE, has resigned his position as local representative of the Ex-Cell-O Corporation. Mr. Ashley has been connected with this company for the past fifteen years.

His future plans have not been announced.

Societies Unite, Hear Steel Company Executive

Elmira, N. Y.—Approximately 125 members of Elmira Chapter, ASTE; members of Southern Tier Chapter, ASM; and guests met October 8 for dinner and a joint technical session at the Mark Twain Hotel. The occasion marked the 19th anniversary of the ASM group.

After a brief business meeting, ASTE Chairman George N. Morceau turned the meeting over to ASM Chairman Don MacQueen who introduced the guest speaker, James P. Gill, Vice-President, Vanadium Alloys Steel Company.

With the aid of several slides, Mr. Gill presented an excellent semi-technical discussion on the subject, "Modern High Speed Steels." Reviewing well-known steels, he showed the effect of constituents upon the properties, and the effects of various methods of heat treatment. He also pointed out the effects of nitriding or oxidizing single edge cutting tools to prevent chip weld or tool loading.

The enthusiasm and interest of the group were indicated in the discussion which followed.

An Allis-Chalmers sound film, "Tornado in a Box," provided an educational and exceptionally well-presented demonstration of the development and operation of the modern gas turbine.

Science Of Measuring

Atlanta, Ga.—"Since the early days of measuring, we have advanced from using parts of the human body, such as hand width and arm length, to modern, magnifying and photographic measuring devices which are accurate to one-millionth of an inch."

This statement, embracing the progress in the science of measuring, was made by C. F. Stayton of the L. S. Starrett Company, Athol, Massachusetts, technical speaker at the November 7 dinner meeting of Atlanta Chapter. A group of 43 members and guests heard his interesting address.

Jack Childs, recently discharged from the Marine Corps, was elected Second Vice Chairman to succeed Charles Jenkins who is acting as Chairman. Mr. Jenkins is completing the term of former Chairman Sydney Barnett has has moved to Florida. * * *

Col. S. S. Cross was the principal speaker at the Chapter's October 3 meeting. Col. Cross described his recent trip to Europe to inspect captured German war plants.

Left: Among Elmira Chapter members who attended October 8 joint meeting with ASM Chapter, in the Mark Twain Hotel, were Jeanette S. Birdsall (left), Tool Designer, Eclipse Machine Div., Bendix Aviation Corporation; and Sara E. Swan, Tool Designer, America La France & Foamite Corporation. Right: ASTE and ASM Chapter executives at speakers' table included (left to right): ASTE Secretary F. B. Allen, ASM Secretary James S. Meyer, ASTE First Vice Chairman Burr W. Jones, ASM Chairman J. D. MacQueen, James P. Gill of Vanadium-Alloys Steel Company, guest speaker; Chairman George N. Morceau, Second Vice-Chairman Edward Stachel and Treasurer James F. Deegan, all of the local ASTE Chapter.

Builders of A. S. T. E.

Ford R. Lamb, President 1936-37

By O. B. JONES, *Society Historian*

DURING FORD R. LAMB'S administraiton, in 1936-37, as the fifth President of ASTE, the Society grew in members and waxed strong. At the beginning of his term, the Society consisted of four Chapters. At the end, it had ten. The membership grew from approximately 550 to more than 1100.

O. B. Jones

Initially the directors' and committee meetings were held at the Detroit College of Applied Science; later in the Heald Machine Company's Detroit offices; and still later at Pioneer Engineering Company. But in November of 1936, the Society was able to rent its own office and pay its way just like any other concern that had a service to render.

Gold Lettered Door

We were as proud of that gold lettered "American Society of Tool Engineers" on our little office door as a new doctor is when he first views the sign on his lawn that proclaims to the world that he has arrived. At last our Society could stand alone and look the landlord, and the whole world, in the eye.

Other National Officers during this year were Frank Shuler, First Vice-President; Luke Beach, Second Vice-President; Frank Crone, Treasurer; and Ray Brunner, Secretary. The Committee Chairmen were Edward Johnson, Nominating; Roy Bramson, New Chapters; H. H. Wilbraham, Membership; W. C. Maier, Industrial Relations; W. H. Smila, Standards; A. E. Rylander, Editorial; E. A. Harper, Publicity, and R. M. Lippard, Constitution and By-Laws.

Efficient Executives

These men, along with the others who comprised the 33 members of the Board of Directors, possessed sufficient knowledge gained from their experience in managing their own individually-owned businesses or in managing sales, engineering or manufacturing divisions of nationally-known corporations, to provide what it took to make the ASTE truly an *American* Society of Tool Engineers.

Few organizations have been blessed with better leadership. Each of these men was a success in his own right; each possessed the natural aggressiveness, ingeniousness and vision of the tool engineer. Each was possessed of the restlessness associated with the creative instinct which found satisfaction in perfecting an organization which today serves tool engineers throughout our nation, and through them, the entire manufacturing industry.

Articles by Noted Authors

During this year THE TOOL ENGINEER blossomed forth with many articles of general and special interest to tool engineers. It commanded the attention of engineers and executives in general by carrying outstanding articles written by engineers, doctors, preachers, professors and presidents, on such subjects as "Broaching," "Factors in Purchase of Machines," "Gage Tolerances," "Tolerances," "Psychology for Tool Engineers," "Precision Boring," "Design for Production," "Feeding Pressures and Horsepowers," and "Design of Special Machine Tools."

Its news of the industry and of progress and development in the field of tool engineering was helpful to management and resulted in the purchase of sufficient advertising space to enable the magazine to assume the proportions of a national engineering periodical.

Good Meetings

F. R. Lamb

The monthly Chapter meetings were well attended because of timely lectures on such diversified subjects as "Russian Industry," "Co-ordination of Tooling Procedures," "Manufacture of Abrasive Products," "Material Handling," "Cutting Oil and Lubricants." "Production of Fine Watches," "Plastic Molding," "Developments in Drop-Forging Procedures," "Gear Design," "Gear Inspection," "Horsepower Requirements in Machining," "Feed Pressures in Machine Tools," and many other topics of special value to tool engineers.

Then there were talks of a general educational nature on, to name but a few, "Business and the Abundant Life," "Abraham Lincoln," "The Work and Functions of the F.B.I.," "The Place of the Technical High-School in the Community," and so on. The Tool Engineer was becoming educated. The Society was fulfilling its mission.

There was then, even as there is now, a conviction that Tool Engineers as individuals, and as a group, had much to gain by becoming more articulate. Pleas were made and plans were made to have the members write articles for THE TOOL ENGINEER and to prepare and deliver talks and lectures wherever and whenever possible.

Confidence Developed

The adage and admonition, "Reading maketh a *full* man; writing, an *exact* man; and speaking, a *ready* man," was respected. Many a stuttering, faltering, hesitant and bewildered Tool Engineer became a confident and convincing speaker by availing himself of the opportunities provided for his development in the speaker's club and the monthly meetings.

The Society was organized to build men. It was organized to give men something to build. . . . "Wisdom hath builded her house, she hath hewn out her seven pillars; she hath killed her beasts; she hath mingled her wines; she hath also furnished her table."—*Proverbs IX, 1–2.*

* * *

EDITOR'S NOTE—Ford R. Lamb, the Society's fifth President, passed away in October of 1941 after an extended illness. At the time of his death, he was the first Executive Secretary of ASTE, having held this office since his retirement from the Presidency in 1937.

A charter member of the Society, he always had its welfare close to his heart. In 1934 he became Second Vice-President and, the following year, First Vice-President. For two years, from 1940-42, he was Assistant to the National Constitution and By-Laws Committee.

Mr. Lamb was a native of Williamston, Michigan. His engineering experience included associations with Consolidated Machine Tool Corporation; The Studebaker Corporation; Detroit Forging Company, and other concerns. For a time he taught Tool Design at the Detroit College of Applied Science.

Peeking at Chairman Carl B. Christensen's agenda for October 3 meeting of Fairfi-ld County Chapter are (left to right): Secretary J. D. Dailey, Otto Weitman of Lepel High Frequency Laboratories, speaker; Director E. J. Berry of Providence, Mr. Christensen, and Program Chairman Charles Gluck.

Induction Heating Program

Bridgeport, Conn.—Fairfield County Chapter opened its fourth season on October 3 with a dinner meeting at the Algonquin Club.

Otto Weitman, Vice President of Lepel High Frequency Laboratories, Inc., New York City, spoke on "High Frequency Induction Heating with Spark Gap Operated Converters," augmented by a sound film and slides. His remarks and the subsequent discussion period were enjoyed by the 100 members and guests in attendance.

Director Edward J. Berry and a party from Providence, Rhode Island, were present, Mr. Berry speaking briefly on the Society's activities.

Instrument Making Described By Egy

Kansas City, Mo.—Willard L. Egy, Works Manager, Brunson Instrument Company, was the featured speaker at the November 8 meeting of Kansas City Chapter, held in the Pine Room of the Union Station. His subject was "Instruments and Instrument Making."

Mr. Egy, who has had 25 years' experience in the designing of all kinds of instruments, reviewed their early history and development. He outlined the intricate requirements met by the instrument industry during World Wars I and II and explained how the industry can keep abreast of the post-war development program.

The speaker related interesting personal experiences, such as the designing of equipment for studying the causes of coal mine explosions, measuring pressures and velocities of such explosions; and drawing platinum wire down to a diameter of 20-millionths of an inch, by casting silver around the wire before drawing through dies to the desired size, then chemically removing the silver. He informed the group that glass is now drawn down to the same diameter and is used for cross-wires in telescopes instead of spider webs. Glass filament also measures the air leakage in the canvas sails of the Vanderbilt yacht, he commented.

Fred N. Epperson, Chief Tool Designer, Aireon Manufacturing Corporation and Chapter Education Chairman, conducted an open discussion on "Tool Steel Testing Methods," distributing specially-prepared charts to the audience.

Subber Factory Manager

Philadelphia, Penna.—L. S. Subber who recently joined Fischer & Porter Co., of Hatboro, Penna., as Production Engineer, has been promoted to Factory Manager.

L. S. Subber

Most Tool Engineers are familiar with the Fischer & Porter Rotameters used on controlled atmosphere furnaces for measuring the gas flow. Many have seen the F & P remote reading meters, controllers, recorders, proportioners, integrators and viscosimeters used in the penicillin, 100-octane gasoline, synthetic rubber, atomic bomb, and jet propulsion programs.

The company is now putting into production a pneumatic transmitter and expects to announce an electronic instrument which will revolutionize automatic control of chemical manufacturing processes. Their ratio controllers are used to blend the ingredients of many beverages.

For the past two years, Mr. Subber has had his own business, manufacturing gages and acting as consultant to several companies making parts for Norden Bombsights and similar war items.

He holds B.S. degrees in Aeronautical and Mechanical Engineering and was formerly employed by E. G. Budd Mfg. Co. and General Electric Co.

More recently, "Len" Subber became well-known in a five-state area, as Application Engineer for the P. A. Patterson Co. of Philadelphia.

In addition to his activities in Philadelphia Chapter, ASTE, where he serves on the Constitution and By-Laws Committee, he is a member of the Philadelphia Society for Instrumentation and of the Franklin Institute of Philadelphia.

Two views of the 53 members and visitors attending the Kansas City Chapter dinner meeting held November 8 in the Pine Room of the Union Station. Willard L. Egy of the Brunson Instrument Company spoke on "Instruments and Instrument Making."

Carbide Milling Cuts Costs

Toronto, Ont.—"High Speed Carbide Milling" was discussed by Howard Pope of Cincinnati Milling Machine Company, before an audience of 120 at the October 15 meeting of Toronto Chapter. His broad knowledge of the subject was apparent in the sustained interest of the group.

Mr. Pope outlined the early history of carbide milling, a process which had made few advances until 1940. With the demands of war, however, research was speeded up. Although Germany outstripped us at that time, by V-E Day developments in the United States, particularly, exceeded the Reich's.

The speaker described the many advantages of this type of milling, including increased production, longer tool life, improved finishes—and most important—lower cost per piece. However, Mr. Pope admitted that the carbides do not and probably will not completely replace high speed steel for milling cutters, as there are advantages to be derived from the use of high speed steel tools in certain instances.

As carbide tools are very sensitive to variations in cutting speed, the use of a fly-wheel was urged to insure even speed. This fly-wheel should be mounted on the arbor as close to the work as possible, and it should be keyed to the arbor so there is no looseness, Mr. Pope cautioned.

Two reels of moving pictures, made in the Cincinnati company's research laboratory, provided excellent illustration for Mr. Pope's talk. They indicated clearly the results obtained when using various cutting angles in combination with a variety of speeds. Photomicrographs were included, showing the geometry of chip formation and the importance of this phase of the work.

Mr. Pope answered questions from the floor at the conclusion of his remarks.

Motion Economy Applied To Tools And Equipment

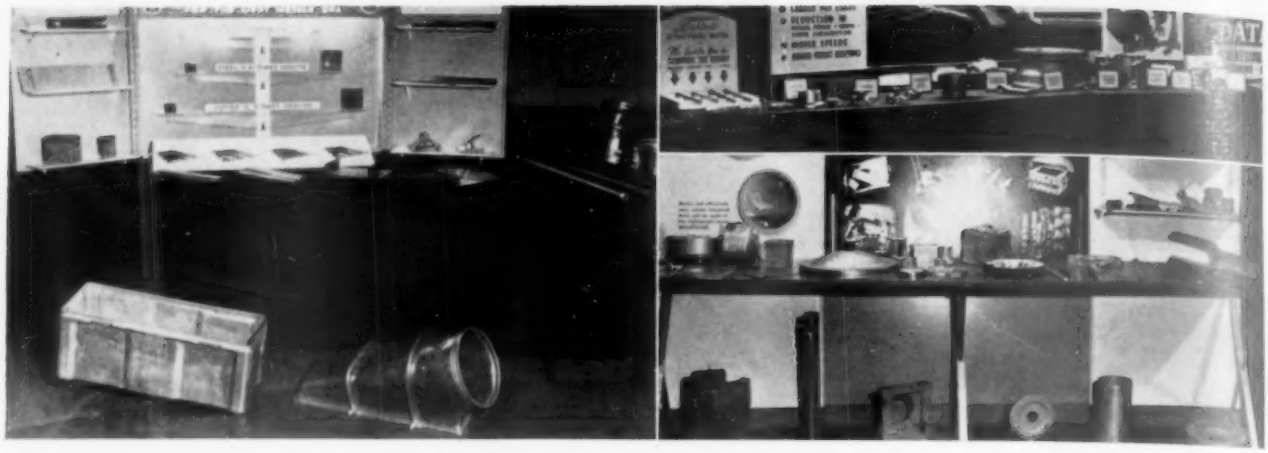
Minneapolis, Minn.—Three factors are involved in the success of a business—high quality, minimum cost, and production on schedule, Everett Laitala, Asst. Professor, M. E. Department, University of Minnesota, reminded Twin City Chapter in opening his lecture on "Motion Economy Applied to Tools and Equipment." Prof. Laitala was the technical speaker at the Chapter's October 10 meeting.

In apraising tool design, the engineer must adapt his thinking to all three of these factors, the speaker stated. An important aid in improving the design of a tool is to think of it as only one part of a process to be performed by an operator, Prof. Laitala declared. He recommended making a sketch of the entire work place, indicating the position of the tool in the workroom layout.

Emphasis was placed on the following points to be borne in mind when designing tools: location of incoming material, and manner in which it is brought to the tool (use gravity delivery when possible); location of completed-parts tote box or skid (use drop delivery when possible); working position of operator (use good chair when possible); consideration of foot-operated mechanisms to relieve hands for useful work; possibility of using quick-acting clamps or ejectors; determination of whether operator is using both hands and whether hand motions are kept within a normal working area (keep movements as short as possible).

In summary, Prof. Laitala said, "The application of motion economy to tools and equipment, therefore, requires only a questioning attitude, an open mind, a liberal dose of common sense, and a few simple principles." Actual working models and a short film supplemented his talk.

Guests, among the 50 engineers in attendance, included Dr. Derso Shybekay of Fort Wayne Chapter.



Three manufacturers co-operated in this magnesium display shown at November 5 meeting of Racine Chapter. Exhibitors were Hills-McCanna Company, Revere Copper & Brass, Inc., and Dow Chemical Company. Speaker was Dan W. Moll of Hills-McCanna, who related "The Past, Present and Future of Magnesium."

Hot Spinning Described By Weiss

New York City—A comprehensive talk on "Modern Methods of Metal Spinning" was presented to Greater New York Chapter November 5 by Edwin Weiss, Chief Engineer, Milwaukee Metal Spinning Company.

Edwin Weiss

Particularly interesting was the phase of Mr. Weiss' discussion which dealt with hot spinning. Slides supplemented his remarks.

During the meeting Third Vice-President T. P. Orchard reported on the efforts, developments and progress of the Society.

A short film preceded the technical session.

Details Die Designing For Plastics

South Bend, Ind.—Jean O. Reinecke of the Barnes & Reineke Company, industrial engineers and designers, addressed South Bend Chapter at their October meeting. Mr. Reinecke's topic was "Designing Dies and Tools for Plastics."

The speaker, in order to present the designing and production problems of plastics, gave a detailed description of the procedure that his company had followed in the development of a new container for Cameo Cleanser. He stated that the containers were made in a four-cavity die heated to a temperature of 350 degrees, with manually-operated cores for forming the internal threads. The Cameo trademark was made in another eight-cavity die and cemented to the large container. Hobbing was used to make the fine detail on the trademark.

Mr. Reinecke said that the appearance of plastic parts depends upon the degree of polish given to the surface of the mold cavity. In order to develop a satisfactory finish, chrome plating is often applied to the molding surface. In cases where plating cannot be used, it becomes a problem of using emery dust upon a wooden stick, vigorously applied with "elbow grease."

A technicolor travelogue, "The Amazon Awakens," was shown as part of the program.

Magnesium Production 100 Times Prewar Rate

Racine, Wis.—"From five to 500 million pounds capacity during World War II is the record of the magnesium industry and . . . a capacity of billions of pounds a year in the course of the next 25 years is not unlikely." With this arresting statement, Dan Moll, Vice-President and Treasurer, Hills-McCanna Company, Chicago, opened his address, "The Past, Present and Future of Magnesium," before Racine Chapter's meeting in the Manufacturers Association Building, November 5.

D. W. Moll

Mr. Moll outlined the progress of magnesium production from World War I to the present. He described its processing from the extraction of the metal from sea water and salt brine to the finished machine casting. Quoting the early high prices of magnesium, he contrasted them with the current low cost per pound resulting from increased production, easy machining and transportation of this light metal.

The speaker weighed the advantages and unfavorably-publicized aspects of magnesium. He predicted lower prices on magnesium alloy castings and more extensive use of magnesium, the lightest and most easily machined of all structural metals, to reduce deadweight, increase payload and decrease physical fatigue.

A sound film, "Magnesium—The Miracle Metal," was shown and a display of castings, forgings, bar, sheet and extruded stock was exhibited by Mr. Moll's company, Dow Chemical Co., and Revere Brass & Copper, Inc.

Attendance at the meeting numbered nearly 150 members and guests. Director L. J. Radermacher of Milwaukee, who paid the Chapter a surprise visit, spoke briefly during the evening.

In October, Warren Jones, General Methods Supervisor of Douglas Aircraft Company, Chicago, spoke on "Statistical Quality Control of Manufactured Products." Mr. Jones demonstrated with slides and charts the economic value of controlling quality and its relation to engineering, tooling and manufacturing.

Radar Effective Weapon Lovell Says

Boston, Mass.—While the atomic bomb probably stopped the war, Radar made possible a two-front struggle terminating in an Allied victory, I. W. Lovell of the Radiation Laboratory, Massachusetts Institute of Technology, pointed out to Boston Chapter when he addressed their October 11 meeting at Schrafft's Restaurant.

Continuing, Mr. Lovell explained that Radar furnished support for ground and air attacks, picking out the Jap navy as an easy target. It not only determined the position of enemy forces to within approximately 16 feet, but also gave our navy and air forces the exact locations of their own planes and ships in any kind of weather.

The submarine menace was reduced to a minimum and Rommel's supply ships located and destroyed through this medium, Mr. Lovell remarked in his discussion of "Radar Indicators."

Technical speaker for the evening was Russell Stewart, Eastern Manager of Kearney & Trecker Corporation, Milwaukee. His subject, "Negative Rake Carbide Steel Milling," included supplementary films and slides.

Mr. Stewart wove an interesting story concerning grades of carbides, ideal surface speeds, chip formation and clearance—its relation to the axial and radial rake angles and the number of teeth in the cutter. The necessity of using a machine with sufficient horsepower and the advantages of storing up energy in a flywheel were also discussed.

Walter Pohle, Boston Chapter's original Gadget Talker, spoke on the adaptation of a small electric drill to the turrets of screw machines or turret lathes, whose spindle speeds are at times too slow. Mr. Pohle described a method of successfully drilling small holes in either first or second operation work. He also demonstrated a patented drill, reamer, or end mill shank which may be used in a sleeve, spindle, collet or chuck, reducing inventory on such tools with a resultant saving.

The 165 members and friends of the Chapter who attended the meeting were highly enthusiastic in their praise of the program. Several visitors from other Chapters were introduced.

High Speed Film Catches Machine Tool Action

Philadelphia, Pa.—High speed motion pictures of milling cutters, planer tools and punch presses in action, taken at the rate of from one to two thousand frames per second, were shown at the October 18 meeting of Philadelphia Chapter. The films were exhibited by L. T. Weller, Works Laboratory, Tool and Gauge Division, Schenectady Works, General Electric Company.

ASTE'er Weller extended greetings from Schenectady Chapter, in his opening remarks. He then screened high speed films of cutting tools in action on steel, brass and cast iron. The motion pictures included sequences of a notching punch and die in operation. Cutters, made of 18-4-1 steel, were shown severing 1020 and 2335 nickel steel. No coolant except Carbola was used, because of smoke masking the action of chips.

Lighting consisted of nine 1200-watt bulbs. Deflection of tools while under cut from chip pressure was indicated by a needle. The notching die showed a deflection of .028" in the bolster plate when under cutting pressure.

An interesting feature on the planer tool was the periodic appearance of a secondary chip, coming from under the main chip. It resembled a little snake sticking its head out, finding all clear, then slithering out and falling away. Mr. Weller explained that this was caused by the build up on the tool point, which breaks away when it becomes too great.

After completing his informative commentary, the speaker answered questions from the floor.

Two exciting films—one featuring tarpon fishing, the other depicting automobile racing in various parts of the world—were shown before the technical session, through the courtesy of the Atlantic Refining Company.

Member "Andy" McMillan furnished music and Entertainment Chairman "Ned" Glenn led the group singing at the meeting which was held in the Engineers Club. Dinner was served to 180 members and guests.

De Cordova Assumes Newly-Created Post

Poughkeepsie, N.Y.—Appointment of Noel de Cordova to the newly-created office of Sales Manager has been announced by the Standard Gage Company.

Noel de Cordova

Mr. de Cordova joined the company in 1942 as Service and Technical Advisor. The following year he was sent to Chicago to open an office and act as direct sales representative for that area. In 1944 he was transferred to Philadelphia for the purpose of establishing another branch office.

For 17 years previous to his employment by Standard Gage, he was associated with the Central Hudson Gas and Electric Company.

Born in Jamaica, British West Indies, he was educated at Riverview Military Academy, Poughkeepsie; Montclair Military Academy, Montclair, N.J.; and at Amherst College, Amherst, Mass.

A former member of Chicago Chapter, ASTE, he is now affiliated with Philadelphia Chapter. He is widely known among golfers in the Hudson River Valley, having been champion of both the Dutchess Golf Club and the Hudson River Golf Association.

Engineers Confer On Comparators

Buffalo, N. Y.—The first conference, in all probability, where men assembled from all parts of the nation, solely to study and discuss the projection methods of optical comparator measurements, was held here recently. The occasion was the Technical Conference of the Engineers Specialties Division of The Universal Engraving & Colorplate Company.

ASTE'ers who participated in the three-day program included Frank Acton, Chief Engineer, Portman Machine Tool Company, New Rochelle, N. Y., who read a paper on "Comparators and Problems Encountered;" and R. Y. Moss, Manager, Production Engineering, Sheffield Corp., Dayton, Ohio, who explained "Sheffield Micro Form Grinders and Charts."

During the war years progress made with optical comparator measurements has been such that many parts heretofore thought to be impossible to check on comparators are entirely practical for production inspection as well as for tool and gage inspection.

Urges Common Sense In Education

Milwaukee, Wis. — The Milwaukee Chapter dinner meeting for October was held on the 11th at the Hotel Schroeder, with Dr. John J. Caton, Director and Founder, Chrysler Institute of Engineering, Detroit, as speaker.

Dr. Caton delivered his well-known lecture, "Common Sense in Technical Education," pointing out the shortcomings of the present setup in schools of higher learning offering engineering courses. He presented some proposed educational programs, and emphasized the desirability of specialized training and the benefits accruing to companies offering such training to their employees.

One hundred and eighty members and guests of Philadelphia Chapter turned out October 18 when L. T. Weller of General Electric Company exhibited high speed films of machine tools in action. Upper left photo shows Mr. Weller addressing the meeting. In top center picture, the audience is viewing a thrilling sports film. Upper right, Chairman John Noble opens meeting held in the Engineers Club. Lower photos show dinner table groups. Head table guests and Chapter officers are seen at long table (extreme right).

Top left: Glen H. Stimson of Greenfield Tap & Die Corporation, technical speaker at October meeting of Flint Chapter, chats with Program Chairman R. G. Freeman.
Top right: W. Reuen Fisher (left) of Universal Engineering Company, Frankenmuth, tells Chairman Michael Skunda about big game hunting in the Canadian Northwest, shown in his film, "Forest Friends." Lower photo shows Chapter at dinner in Fischer's Hotel, Frankenmuth.

Forging Authority Speaks

Indianapolis, Ind.—"Production Forgings and Their Relation to the Tool Engineer," was the subject presented by Waldemar Naujoks, Chief Engineer, The Steel Improvement and Forge Company, Cleveland, Ohio, at the November 1 dinner meeting of Indianapolis Chapter, held in the Lincoln Hotel.

Slides, which accompanied his talk, showed how forgings are made in drop-forging and squeeze type presses. An outstanding authority on forging practice, Mr. Naujoks is the author of "Forging Handbook," generally used throughout the industry.

A number of patients from Wakeman General Hospital, Camp Atterbury, were guests in accordance with Chapter's established practice of inviting several veterans to each meeting as an aid in the Army Surgeon General's rehabilitation program.

Entertainment was provided by the "Sophistocrats of Melody," playing piano, xylophone, accordion and saxophone.

* * *

John Ray, Chief Service Operator of Linde Air Products Company, gave a highly informative talk on "Production Arc Welding" at an earlier meeting. His discussion was illustrated by slides and motion pictures showing the submerged melt weld process applied to parts as small as overseas shipping containers for shells up to extremely large jobs, such as the welding of hulls for cargo vessels.

The welding process is done on an automatic machine in which the rod and the weld being made is completely covered at all times by a flux. No arc is visible. The result is a clean, smooth, homogeneous weld which is absolutely free from all air bubbles and scales, as revealed in Mr. Ray's illustrations.

Quality Control Begins At Machine

Rochester, N.Y.—In company with the local chapter of ASM, Rochester Chapter, ASTE, held its 70th meeting, November 12, attended by approximately 200 members and guests who listened with much interest and enjoyment to Joseph Manuele's talk, "Control of Quality During Manufacture and Its Effects on Production and Costs."

Mr. Manuele, who is Director of Quality Control for Westinghouse Electric Corporation, is a fine speaker well-acquainted with his subject. With the aid of charts and forms, he showed indisputably that quality control originates at the machine and not in the Inspection Department. He indicated that it is the responsibility of the department foreman and his assistants to so instruct the worker in the use of his tools and gages that he has a thorough knowledge of his job. Then, the operator will watch carefully that he does not turn out scrap.

In case of trouble, the workman should report immediately to his foreman—not after he has accumulated a large amount of scrap. If necessary, the quality control group should be called upon to make a study or analysis for corrective measures. Trouble may originate in the tools, the machines, or the material and its treatment. This can be detected by watching the charts, Mr. Manuele concluded.

Have You Mailed Your ASTE DIRECTORY Questionnaire?

Screw Thread Production–Tolerances and Gaging

Flint, Mich.—Technical speaker at the October 18 meeting of Flint Chapter, held in Fischer's Hotel, Frankenmuth, was Glen H. Stimson, Chief Engineer of the Gage Division, Greenfield Tap & Die Corporation, Greenfield, Massachusetts. His subject was "Screw Thread and Gage Tolerances."

Mr. Stimson first discussed the various types of errors found in screw threads and touched briefly on their causes. He showed with slides methods of isolating and measuring these errors by individual ring and plug gages. He also compared tolerances of the different classes of fits, explaining the gage tolerances used in checking these fits.

Although it is possible to isolate and check with gages many of the errors in screw threads and tapped holes, Mr. Stimson pointed out that when gages will not enter, a more accurate check sometimes must be made by shadow type comparators. Actual production operations used in making ring and plug gages were depicted in slides.

The speaker conducted an open discussion, answering many questions concerning the use of these gages.

An excellent colored film, "Forest Friends," was presented by W. Reuen Fisher of Universal Eningeering Company, Frankenmuth. Mr. Fisher made the motion pictures during a hunting trip in the Canadian Northwest.

"Hydraulics Applications" Timely Topic

Chicago, Ill.—Highlight of the November 5 meeting of Chicago Chapter, held in Huyler's Restaurant, was the discussion of "Practical Application of Hydraulics on Machine Tools and Fixtures" by A. B. Riddiford, Hydraulic Engineer, John S. Barnes Corporation, and J. B. Bulliet, Electrical Engineer for this company and for W. F. and John Barnes Corporation, Rockford.

Since the machine tool industry is now using hydraulics extensively, this proved an interesting and timely subject. Mr. Riddeford discussed hydraulics—its origin and applications. Slides were shown and the speaker explained the functions of various types of hydraulic systems and their practical applications to machine tools and fixtures.

Using slides, Mr. Bulliet described how and why electricity is needed with hydraulic units. He showed where electricity is necessary for the safety of the operator, and the timing of the movements that the cutting tools and fixture must make during a complete machining cycle. Both speakers answered questions presented to them by the audience at the conclusion of the program.

Special exhibits, shown before the dinner hour, were displayed by Anker-Holth Mfg. Company, The Cleveland Pneumatic Tool Company, Machinists Tool Company, and Boyd-Wagner Company. Chucks, collets, pneumatic tools, sapphire products, precision machined parts, and cutting tools were exhibited, with company representatives on hand to answer questions.

After dinner Chairman F. A. Armstrong presented to Immediate Past Chairman J. R. Miller, on behalf of the Chapter, a Past Chairman pin as a token of his splendid work in the Chapter during the past year.

Society's President Visits Louisville

Louisville, Ky. — President C. V. Briner was guest speaker for the November 12 meeting of Louisville Chapter, held in the Kentucky Hotel.

C. V. Briner

Mr. Briner gave the Chapter a very interesting and informative account of the Society's activities, including the publica- of THE TOOL ENGINEER, the "Tool Engineers' Handbook" and the ASTE Directory, the New Era Exposition to be held next April in Cleveland, and the progress of the Education and Standards committees.

In the course of his remarks, Mr. Briner called attention to the phenomenal growth of the Society in scope and membership.

At the conclusion of his discussion, President Briner presented Charles Peters with the Chapter's gift of a Past Chairman's pin.

* * *

At the October meeting, differences in the design of dies for inclinable and upright presses were explained by Joseph I. Karash, Chief Engineer, Reliance Electric and Engineering Company, Cleveland.

J. I. Karash

Mr. Karash presented these contrasts in design in a sequence of fundamental principles and development. The inclinable press can be a source of great economy, the speaker stressed, and at the same time result in a perfect operating condition from the standpoint of safety.

However, Mr. Karash cautioned, the dies must be specifically designed for its operation. If a punch press is unsafe for the operator, the design of the die is incomplete, he emphasized. Often the designer falls short, sacrificing safety as well as productive capacity and quality of product, the speaker commented.

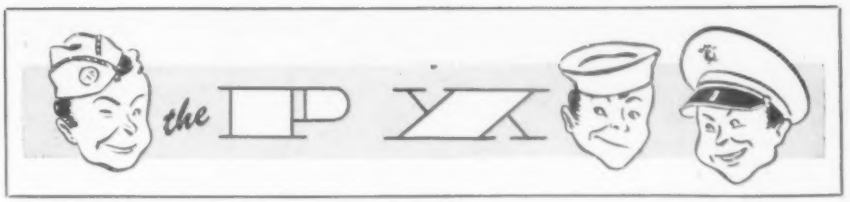
A feature of the well-attended meeting was Chairman John H. Thomas' introduction of every engineer present.

Traveler Describes Tooling In China

Hartford, Conn.—Francis P. Healey, Chief Engineer, Automotive Division, Van Norman Company, Springfield, Massachusetts, gave Hartford Chapter members firsthand information on "Tool Engineering In China" when he addressed their October 1 meeting.

Mr. Healey, who spent considerable time as an activated Colonel at automotive depots on the Burma Road and in many other Far Eastern stations, related his experiences in the Orient. His description of the work of the Chinese government, particularly in the technical field, proved very enlightening and thoroughly enjoyable to his entire audience.

As coffee speaker, Miss Edith Yeomans, Director of the Union Settlement in Hartford gave the group a better understanding of the activities of this organization.



A.S.N. 44102991
S.E.D.–P.O. Box 180
Santa Fe, New Mexico

Dears Sirs:

Just a few words of apreciation of the fine work you are carrying on. You are doing a swell job and we fellows in the service are pulling for you so that tool engineering will be an even better career when we return to civilian life.

By copy of THE TOOL ENGINEER is forwarded every month and all the fellows in the barracks, whether members or not, read it from cover to cover with great pleasure. It is proclaimed "tops" in the field.

I'm assigned to the Manhattan District (atomic bomb project) at this time and, because of its technical nature, it is small wonder that I have found a good many tool engineers working here on various assignments.

Again, I say, keep up the swell work. I'm anxiously awaiting the Handbook.

Yours truly,
Pvt. Charles A. Seay
Atlanta Chapter

* * *

Class 44–45, Brks. 13
NATTC Ward Island
Corpus Christi, Texas

Dear Sirs:

I do so much enjoy hearing from you and receiving THE TOOL ENGINEER. I now am in advanced radio school but my heart is still with machine tools. At least my stay in the Navy has acquainted me with the importance of electronics in machine tools. While working at Sundstrand, I realized how this development was coming more and more into its own.

I'll be looking for further news and items from you.

Yours truly,
S1/c Ross Carlson
Rockford Chapter

(Home Address)
15904 Arcade Ave.
Cleveland, Ohio

Gentlemen:

I have been receiving THE TOOL ENGINEER quite regularly for which I wish to extend my sincere thanks.

Instead of idling away my hours while waiting for my discharge, I've been reading THE TOOL ENGINEER and find it very interesting. It keeps me informed of recent developments. After three and a half years away from the drawing board, I look forward to returning some day soon.

My regards to the members of a great organization of which I am proud to be a part.

Sincerely,
Frank Zakrajsek
Cleveland Chapter

* * *

Co. "D", 8th Tng. Btn.
Fort McClellan, Ala.

Gentlemen:

This is rather belated thanks for the membership card for service men. It is a very pleasant feeling to know that I may maintain my membership in ASTE even though I am in the army. Thanks again for the card.

When I was home on furlough, I saw several issues of THE TOOL ENGINEER. I wish to congratulate you on the fine job you are doing with it. I always got many productive ideas from it.

At present I am stationed here at McClellan as one of the instructors in the Infantry Replacement Training Center.

Thanks for your interest and letters and the best of luck to you of the ASTE.

Very truly yours,
Sgt. Lloyd K. Clark
Binghamton Chapter

WANTED: More letters from servicemen, relating interesting wartime experiences and activities, whose publication was previously subject to censorship. Address letters and photos (if possible) to Editor, *ASTE News*, THE TOOL ENGINEER, 550 W. Lafayette, Detroit 26, Mich.

Guest speaker at North Texas Chapter October 26 was Russell Smith, Regional Director for the Smaller War Plants Corporation. Mr. Smith discussed "Reconversion and Availability of Tools." Photo of head table shows (left to right) A. F. Miller, until recently First Vice Chairman; B. F. Zeigler, Second Vice Chairman; Mr. Smith, the speaker; J. B. Smith, Entertainment Committeeman; a visitor, and E. H. Leinbach, Treasurer. Fifty-six members and guests attended the meeting.

ASTE Sunburst Emblem Proves Prophetic Symbol

THE WARTIME ACHIEVEMENTS of Tool Engineers, in implementing the greatest mass production operation in history, have vindicated the faith of the Society's founders—the men who selected an appropriate ASTE emblem which becomes even more significant in the Tool Engineer's role of controlling our peacetime economic destiny.

"As the sun throws its light all over the universe, so do the ideas of Tool Engineers burst forth to improve methods of manufacture," explained Fred L. Hoffman to the first ASTE Board of Directors.

Mr. Hoffman, as Chairman of the Emblem Committee, was reporting his Committee's choice of a sunburst design to symbolize the profession of tool engineering. This motif, singled out from the numerous ones submitted, was adopted by the Board on April 28, 1932—while the Society was still less than a month old.

Reminiscing on the circumstances surrounding the decision to adopt an official emblem, Mr. Hoffman, a member of Detroit Chapter and Tool Designer at Packard Motor Car Company, Detroit, relates:

Publicity Needed

"Frequent meetings of the Board, of which I was a member, were essential to get things moving and to determine methods of publicizing the Tool Engineer—then little recognized by industry except as a necessary evil!

"The Board decided that an emblem was necessary to attract attention and to advertise the Society. I was made Chairman of the Emblem Committee which included William J. McKeen. As the Society did not have an office, we were permitted to meet in the office of O. B. Jones of the Detroit College of Applied Science.

"We met several times with proposals, but we were not satisfied until our present emblem was received. This was submitted by William McKeen. The colors chosen were blue, gold and white. Blue enamel was to be used for the background, with the flaming sun in the center in gold, and the letters 'ASTE' superimposed in white. A red enamel background was to distinguish the Junior emblem from the blue-grounded pin designating Senior membership.

Jewelers Bid on Pins

"After this design was approved by the Board of Directors, I contacted several manufacturing jewelers for bids on an initial order of 100 pins. The contract was let and completed and I then had the job of selling the emblems among the approximately 150 members—many of whom were without jobs.

"In deciding on this particular design, the Committee and the Board displayed their confidence in the engineers and their abilities. The flaming sun represented the Tool Engineers with their ideas bursting out and in a shining light and trying to release the engineers from this period of retrogression. This light was always in evidence behind the letters 'ASTE.'

"We knew engineers had the 'know-how' to develop our technology, if they could overcome their status quo. Our confidence was amply justified in the events of World War II, in the so-called 'Miracle of Production.' This term is a misnomer. When the engineer was given the green light, he designed the greatest technology the world has ever seen and the result was an abundance of the means of destruction to win the war.

Applied Science to Production

"We have had an opportunity to show the world what engineers can do to produce an abundance of goods and services by the application of scientific methods. Now the engineer is confronted with a new problem—of trying to distribute this abundance by also applying science to arrive at a solution."

Mr. Hoffmann's account of the inspirational value of the Society's emblem is corroborated by William J. McKeen, now a member of Northern New Jersey Chapter and partner in McKeen and Stoothoff, Ridgewood, New Jersey. Mr. McKeen submitted the design now recognized as the insignia of an international organization of more than 18,000 members.

Mr. McKeen recalls: "The spring of 1942 seemed to present a doubtful future for Tool Engineers in the Detroit area. Unemployment had become an acute problem everywhere and articles in newspapers and magazines blamed mass production and high-speed methods in industry. Tooling programs were pared

F. L. Hoffman

W. J. McKeen

to new lows and many a Tool Engineer wondered if he should have taken up this line as a life career—maybe it was on its way out.

"Amid these unpleasant thoughts an invitation was passed around to all Tool Engineers in the Detroit area to be present at a meeting which had been arranged to discuss plans for a society. The presence of 'Joe' Siegel, 'Bill' Smila, 'Al' Sargent, and O. B. Jones at the meeting lent an air of reliability to the project in question, and their informal talks to the assembly were just about what everyone's morale needed. Each one of us present felt that these men knew what they were talking about and that a Society under their leadership would not be any fly-by-night affair.

New Era for Tool Engineers

"I went away from that first meeting of the ASTE feeling that a new day was about to dawn for Tool Engineers, in which they would become an entity instead of a group of scattered, struggling individuals—each with a very imperfect knowledge about how anybody else did the thing he was trying to do.

"In due time officers were elected and committees formed, among which latter was the 'Emblem Committee' headed by Fred Hoffman, in charge of the Methods Department at Packard. 'Joe' Siegel, the first President, was in charge of tool designing at the same company, and as I was a tool designer there and occasionally made sketches, I was 'in the middle.' Messrs. Hoffman and Siegel insisted upon my producing something which would be presentable, and to them belongs much of the credit for the ideas behind the design.

'I cannot remember how many ideas were considered—several were presented to the Committee and some were doomed before they got that far. Besides the design selected, I submitted others which were criticized and rejected. The motif eventually adopted originated with a diamond-shaped outline which was criticized because it looked too plain and severe, so the sides of the diamond were bulged. The sharp corners were rounded by small radii.

Initials Form Design

"The emblem must carry the Society letters, so these were set across the center, the 'A' and 'E' being formed to suit the outside contour. There now remained two little triangular spaces which looked rather bare with no design to form a background for the letters. Searching my mind for a suitable background, I thought back to the night of the first meeting and the feeling which it gave me that a new day was rising on Tool Engineering. Carrying this thought further, the arts of Tool Engineering, instead of being hidden in the dark corners of engineers' minds, in various companies, would now be marshalled in organized form, available to anyone, and would become a light to all industry.

"As those who lived through that time will remember, the Depression didn't end that first year—nor the next—and there were times when it looked as if the 'sun' was going to go down again. But it didn't, and it is gratifying to a charter member to see it still shining brightly to the extent of 18,000 members.

"It has come a long way from the days of that first Chapter, and we have every right to believe it will keep shining far into the future."

Enters Photographic Field

St. Catharines, Ont.—Otto R. McIntee, former Process Engineer for McKinnon Industries, Ltd., has established the Commercial Photo Copy Service for the production of photostats, blueprints, commercial and industrial photography.

O. R. McIntee

Specializing in photographs of industrial tool applications and machine tool operations, and reproductions of engineering drawings, the new company provides an essential service for tool engineers.

Since 1937 Mr. McIntee has been associated with McKinnon Industries in this city. During the past four years he has served as Process Engineer. Earlier he spent a number of years in the photostat business at Detroit.

As a child he moved to the United States from his native Canada, receiving his education at Port Huron and Detroit.

Mr. McIntee was first affiliated with Hamilton Chapter, ASTE, later becoming a charter member of Niagara District Chapter. In this group he holds the offices of Historian and Photographer.

Situations Wanted

HONORABLY DISCHARGED VETERAN desires position as tool designer in the United States. Ample engineering background, including 1½ years aircraft tool designing; 2½ years topographical and construction engineering; 1¼ years chemical engineering; 2 years mining engineering; 3½ years mechanical engineering in college. Excellent references. Write Box P, American Society of Tool Engineers, 1666 Penobscot Bldg., Detroit 26, Mich.

Breeler General Manager Of Allegheny Plant

Dunkirk, N.Y.—Walter R. Breeler has succeeded Charles Spittall, retired, as General Manager of the local plant of Allegheny Ludlum Steel Corporation. Formerly Assistant General Manager, Mr. Breeler has been with the Dunkirk plant since 1934.

W. B. Breeler

The holder of many United States and foreign patents on steels and steel processes, Mr. Breeler is a member of the American Iron and Steel Institute, and served on its wartime technical committees for tool steel, shells, machine gun and bullet core steel. He is also affiliated with SAE, ASM, and Buffalo Chapter of ASTE.

During the war, he worked with the Office of Scientific Research and Development, of the National Defense Research Committee, in the development of ordnance material.

Before coming to Allegheny Ludlum, he was associated for a number of years with Whitman & Barnes of Detroit, Atlas Steel Corporation of Buffalo, and Thompson Products Company, Cleveland.

Born in Cleveland, Ohio, Mr. Breeler has had degrees in chemical and metallurgical engineering conferred upon him by Case School of Applied Science in that city.

Shows Multiple Drilling Techniques

Richmond, Ind.—Robert A. Schafer, Chief Development Engineer, National Automatic Tool Company, was the principal speaker at Richmond Chapter's October 9 meeting in the Leland Hotel.

In Mr. Schafer's address, "Multiple Spindle Drilling Operations and Tooling Techniques," he outlined the history and development of modern multiple drilling, describing special drilling and boring machines and their applications. His talk was illustrated with a series of slides showing both machines and parts drilled.

One of the organizers of Richmond Chapter, Mr. Schafer now serves as Constitution and By-Laws Chairman.

Floyd Baker, new basketball coach for Richmond Senior High School, spoke briefly during the coffee period, giving the members an insight into the training of a basketball team.

Eighty members and guests attended the dinner meeting.

New Centerless Machine Grinds Threads

Baltimore, Md.—Another of the outstanding speakers Baltimore Chapter has been fortunate in securing this season addressed the November 7 meeting at the Engineers Club, when M. S. Gjesdahl, Research Engineer, Landis Tool Company, Waynesboro, Pennsylvania, spoke on "Centerless Thread Grinding."

M. S. Gjesdahl

Mr. Gjesdahl outlined the changes in design necessary to adapt the centerless grinder to thread grinding—a new process of great interest to users of abrasives. First, he said, the crusher attachment was built into the grinding wheel base, with a motor drive for this unit. This was in addition to the hydraulically-operated diamond dresser for the grinding wheel. Second, an auxiliary speed reduction was provided for the regulating wheel so that its rotative speed could be further reduced. Third, a new-type work rest was designed to meet the special requirements for thread grinding. Fourth, the electrical controls were engineered to provide flexibility.

Early trials in grinding threads by this method were made on oversize screws, the speaker stated. Later experiments demonstrated the possibilities of grinding screws from the solid blank. The machine now grinds accurate, smooth threads in hardened steel set screw blanks in a single operation, with a decided increase in production.

Figures on grinding ¼-20 screws were quoted by the speaker as an example of the production volume possible. An economical rate of grinding this size screw is 25-30″ length per minute. This means a quantity rate of 50-60 per minute on one-half inch long blanks. Often, Mr. Gjesdahl indicated, it is possible to operate continuously on this type of work for eight hours or longer without recrushing the form on the wheel. During an average eight-hour day, grinding production of the half-inch length screws will range between 15,000 to 18,000 he estimated.

An able speaker, Mr. Gjesdahl handled a difficult subject in a very practical manner, describing in detail and with great clarity the sequence of operations involved in the new threading process.

Dinner was served to 76, with attendance increasing to 125 for the meeting and technical session.

Faragher Discusses Aluminum Industry

Pittsburgh, Pa.—Dr. T. V. Faragher, Research Engineer for the Aluminum Company of America, addressed Pittsburgh Chapter, November 2. His subject was "Manufacturing Processes of the Aluminum Industry."

Dr. Faragher made an interesting topic doubly so by his ability to discuss all phases of aluminum manufacturing from the standpoint of one who is thoroughly familiar with its every aspect. He pointed out that aluminum can be worked in much the same manner as steel with the addition of the extrusion process which makes it possible to develop some very intricate forms rapidly and efficiently.

At the conclusion of his remarks, the speaker showed a splendid film which took the audience on a tour of several of the Aluminum Company's plants, revealing in detail some of the previously-explained manufacturing methods.

Second Vice-President W. B. Peirce reported on the actions taken at the recent Semi-Annual Meeting in Detroit.

One hundred and twelve members and guests were present at the Fort Pitt Hotel dinner meeting.

Edison Not Inventor Of Man-Made Abrasive

Fond du Lac Chapter has issued a correction amending its report of the Chapter's September 14 meeting. The report, published in the October TOOL ENGINEER, contained an account of the address given by Francis D. Bowman, Director of Public Relations, Carborundum Company, Niagara Falls, New York.

The article stated: "Mr. Bowman reviewed the origin of the 54-year old grinding industry, when Edison laboratory workers poured a mixture into a simple iron pot and, by means of a carbon rod connected by open wires to a power source, made the first carborundum crystals."

Mr. Bowman related in his lecture that it was Dr. Edward Goodrich Acheson who created the first man-made abrasive in 1891, whie working in his little shop at Monongahela, Pennsylvania. The accompanying motion picture film, presented by the speaker, showed Dr. Acheson re-enacting his now-historic experiment. A reference to Edison occurred when Mr. Bowman commented that the inventor had been earlier associated with Dr. Acheson.

THE TOOL ENGINEER regrets publishing this misinformation.

At left, Past Chairman Dwight Bardes and Editorial Chairman G. C. Wood of Pittsburgh Chapter confer during November 2 meeting. Center: Dr. T. V. Faragher of the Aluminum Company of America explains "Manufacturing Processes of the Aluminum Industry." In the photo at right, Second Vice-President W. B. Peirce brings news of National developments at ASTE Semi-Annual Meeting in Detroit. Seated are Chairman C. E. J. Brickner, Secretary W. S. Risser, First Vice-Chairman W. H. Schott, and Second Vice-Chairman A. S. Harris.

Writers At Work On 85% Of "Tool Engineers' Handbook"

APPROXIMATELY 85% OF THE contents of the "Tool Engineers Handbook" is now in preparation, with many nationally-known technical writers serving as contributors. Those responsible for specific sections of the first ASTE engineering reference work include:

Hans Ernst

HANS ERNST, Director of Research, The Cincinnati Milling Machine Company, Cincinnati, Ohio. Mr. Ernst, who has been in charge of the research and development work in his company for the past 18 years, was born in Australia.

After graduating from the Melbourne Technical College, he spent four years in engineering design and teaching before coming to this country in 1915. His first job here was with the Pullman Car Company of Richmond, Calif.

Did Research in Ammunition

In 1917 he began an eight-year association with the Western Cartridge Company of Alton, Illinois, in research and machine development connected with the manufacture of ammunition and sheet metal specialties. His work with this company was interrupted during World War I while he served a year in the Royal Air Force, Canada.

Mr. Ernst has contributed many technical articles and has appeared as a speaker before the various technical societies, with special reference to the machinability of metals. He is the author of "Machining of Metals."

Affiliated with ASM and ASTE, he is also a Fellow of ASME, member of American Association for the Advancement of Science, Sigma Xi, and director of the Cincinnati Engineering Society.

* * *

Since entering the metal working field at the age of 17, WALTER L. SMITH, Chief Engineer, Butler Manufacturing Company, Kansas City, Missouri, has been engaged in engineering and shop work for a quarter of a century. Seventeen years of this service has been in supervisory capacities.

Assiduous Student

An important factor in his success has been his persevering quest for technical knowledge. Graduating from Manual Training High School in 1919, he next completed four years' work at Kansas City Junior College Night School, studying advanced machine design, mathematics and concrete design. He also finished correspondence courses in mechanical engineering, combustion engineering and college algebra.

Meanwhile, Mr. Smith was securing practical experience in various industries. His first connection was with the Baird Pneumatic Tool Company at Independence. During his three years at this plant, he served his apprenticeship in the machinist trade, becoming a journeyman machinist.

Then he went to Irving-Pitt Manufacturing Company, Kansas City, as a tool design draftsman. Later, he did designing, detailing and engineering work on the recording machines produced by the Cameragraph Company. In 1925 Robbins Thompson Engineering Company retained him as a mechanical engineer. From 1927-1929 he was Production Manager and Chief Engineer at the Economy Electric Manufacturing Company.

For the next three years he was Vice President in Charge of Engineering and Production at Dyer Welding Machine Company. The depression year of 1933 found him at work on the Chevrolet assembly line at Fisher Body.

Went to Butler in 1934

Mr. Smith's present association with Butler Manufacturing Company was begun 11 years ago when he started work as a mechanical engineer in the Coal Stoker Division. Subsequently he was made Chief Product Engineer in charge of this division, and in 1940 he was given the responsibility of Chief Engineer for the entire company.

W. L. Smith

The Engineering Department is responsible for research, product and tool design, manufacturing methods, purchase of tools and equipment, and all production setups.

During the height of the war production program, a disastrous fire at the Galesburg, Illinois, plant destroyed much of the factory and equipment, stopping work on prime government contracts. In the resultant tremendous reconstruction project, Mr. Smith's department played an important part.

Kansas City Charter Member

When the ASTE Kansas City Chapter was organized in 1943, Mr. Smith became a charter member and was elected to serve as Second Vice Chairman. He is a registered professional engineer in the State of Missouri.

* * *

Persistence and patience in acquiring an educational background as a foundation for an engineering career have been rewarded for C. H. BORNEMAN, Supervisor, Tool and Gage Service, General Electric Company, Schenectady, New York.

C. H. Borneman

When he was 15, Mr. Borneman began a four-year apprenticeship with Many & Mayer who conducted a repair shop in his home town of Indianapolis. Upon the completion of this course, he spent a year as a journeyman machinist for the same company. Then came two years of diversified experience as a tool and gage maker in several Indianapolis plants, followed by a semester as instructor in machine and forge work at the Springfield, Illinois, High School.

In the final year of the first World War, Mr. Borneman went to the Arsenal at Watervliet, New York, as a gage-maker. During his spare time he did high school work under a private tutor, to meet college entrance requirements. Three years later when he severed his connection with the Arsenal to enter Purdue University, he had risen to the post of Assistant Foreman of the Gage Section. At Purdue, he specialized in factory management, graduating with a B.S. in Mechanical Engineering.

Equipped with both practical and theoretical knowledge, he joined the Schenectady Works of General Electric Company in 1925. Here, a factory training course served as preliminary to an assignment on the General Superintendent's staff. Supervisory positions in the Carbon Products, Refrigerator Cabinet, and Inspection departments led to his present post.

A charter member of Schenectady Chapter, ASTE, he has chairmanned the Nominating, Industrial Relations, and Meetings committees. He is also affiliated with the local section of ASME.

* * *

Self-educated through advanced home study, C. D. WRIGHT, Chief Tool Engineer, The McKinnon Industries, Ltd., St. Catharines, Ontario, has in turn disseminated tool engineering knowledge by writing technical articles and papers, and teaching engineering classes.

Following his graduation from Weston High and Vocational School, Weston, Ontario, Mr. Wright continued his engineering studies for five years in Toronto Evening School. Then he undertook an extensive, four-year International Correspondence School curriculum in applied mechanics, strength of materials, machine design, and professional engineering mathematics. This he complemented with an Alexander Hamilton Institute course in modern business.

C. D. Wright

Practical Experience

Meanwhile he was busy applying his new-found knowledge at Massy-Harris Company, Ltd., Toronto, where he was engaged as a mechanical draftsman in the design and development of farm implements. Employment as a draftsman at Trane Company of Canada, Toronto, gave him experience in designing heating and ventilating systems. From there he went to Joseph Stokes Rubber Company, Welland, custom molders of hard and soft rubber and composition, to be Chief Product and Die Designer.

During 1938 he left this concern to make his present connection with McKinnon Industries, improving manufacturing methods, designing the attendant machinery and tools as well as equipment for new production.

Organizer of the first tool design class in Canada, sponsored by War Emergency Classes, Mr. Wright taught this subject at St. Catharines Collegiate and Vocational Institute, from 1941-44.

Writes Technical Articles

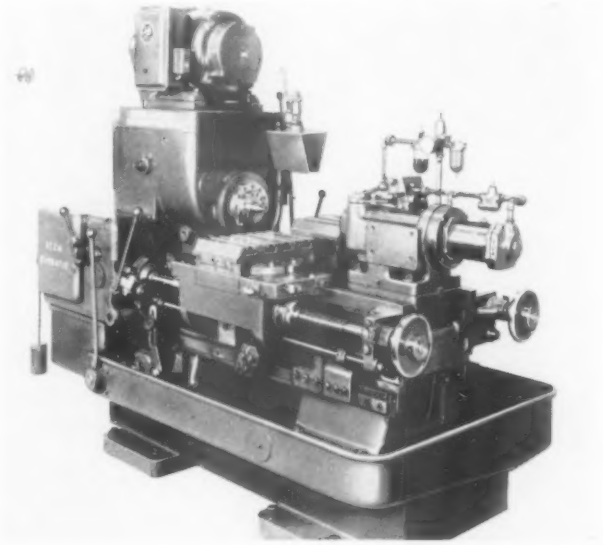
His technical articles have appeared in PLANT ADMINISTRATION MAGAZINE and THE TOOL ENGINEER. As guest speaker at Hamilton Chapter, ASTE, he delivered an address on "Gaging Systems."

First becoming affiliated with ASTE at Toronto, he transferred to Hamilton when that Chapter was formed. In this group, he served on the Nominating Committee. With the chartering of Niagara District Chapter last year, Mr. Wright was elected Chairman. Under his administration, the Chapter doubled its membership during its first year.

TOOLS OF TODAY

Automatic Lathe For Small Jobs

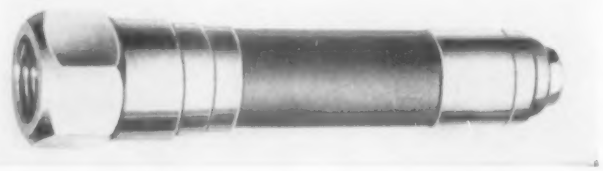
A NEW AUTOMATIC LATHE—the **2A DUOMATIC**—has been developed for improved production of small jobs by *The Lodge and Shipley Machine Tool Company*, Cincinnati.



An addition to its line of automatic lathes, the new 2A provides full automatic handling of small work, extending profit possibilities formerly obtainable only on the larger 3A Duomatic, of which it retains all the features. The new 2A, it is stated, provides a more effective use of multiple tools in turning, and straight and angular facing operations. As the name implies, the 2A Duomatic is dual in construction, and is especially designed for quantity production of lathe work arranged between centers, on an arbor, or in suitable chucks or fixtures, yet is claimed to be equally Duomatic, of which it retains al lthe features. The new

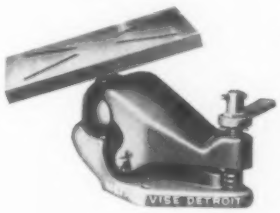
Flexible Tip Air Gun

THE RE-DESIGNED HECO **FLEX-TIP AIR BLOW GUN**, now in production by the *Heckethorn Manufacturing and Supply Company*, Littleton, Colorado, is said to be adaptable to every purpose calling for application of air. Flexing the elastic tip, by pressure of thumb or finger, controls valve to release a delicate draught or steady, high-pressure stream. Connections are brass, except the hardened steel nose. Outstanding merits claimed are simplicity of design—streamlined with no handles, levers, triggers, springs or push-buttons—and indestructibility. Can be dropped, thrown or dragged without damage. Now available for ¼" standard pipe thread, with heavy duty ½" pipe thread being developed.



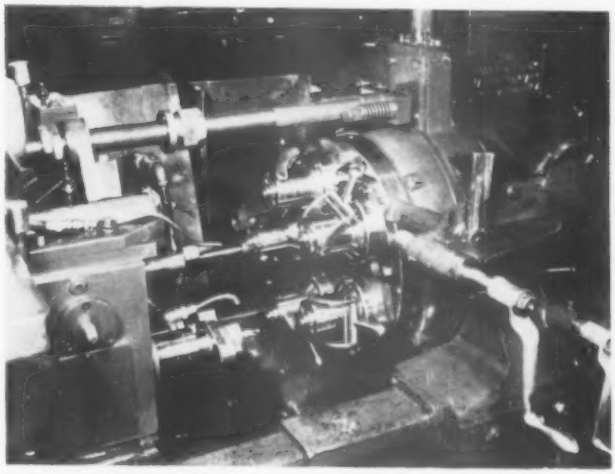
All-Angle Positioner

A NEW **METRO POSITIONER**—Model S—is designed to advantageously position work during various assembly or fitting positions. Produced by *Metro Vise Company*, Detroit, the positioner permits tilting the work to any desired angle almost immediately and without stopping work to manipulate the wrench. In use, the existing vise or fixture is bolted to the face plate of the positioner. This plate is integral with a ball turning in the socket formed by two clamping jaws. The jaws maintain a firm grip on the ball, yet, tension is such that the ball "rolls" in the socket when a change in tilt angle is desired. There are no fixed graduations, hence, there is unlimited movement in any angle or direction.



New Collet Holding Fixture

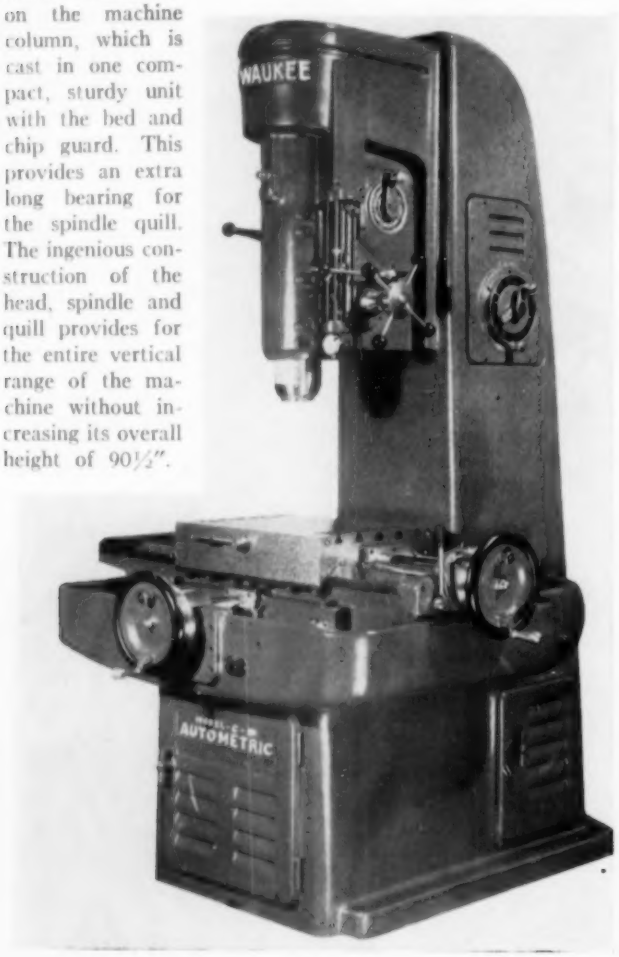
A NEW **HOLDING FIXTURE**, by *Zagar Tool Inc.*, 23880 Lakeland Blvd., Cleveland, permits up to 16 tools advantageously disposed in a single setup on indexing table machine tools. Six of these holding fixtures are shown mounted on a Goss & de Leeuw multiple spindle chucking machine. Here, the tool spindles rotate, the fixtures standing still.



When the table indexes (1/6 rev. per cycle) it automatically opens and closes the collet fixture. The fixtures are low, having an overall height of only 3". A locator, 2¼" dia. x ½" long protrudes beneath the base and serves as a locator. A 5-C type collet is used, with a horseshoe type handle standard. However, other types of handles can be furnished—as the square handle in the G & deL installation.

Automatic Boring Machine

THE NEW **MODEL C MILWAUKEE AUTOMETRIC BORING MACHINE**, by the *Kearney & Trecker Products Corp'n*, Milwaukee, has been developed to handle a wide variety of precision boring from precision production jobs to the finest tool room work. A stationary boring spindle head is mounted on the machine column, which is cast in one compact, sturdy unit with the bed and chip guard. This provides an extra long bearing for the spindle quill. The ingenious construction of the head, spindle and quill provides for the entire vertical range of the machine without increasing its overall height of 90½".



In design and manufacture, the builder has placed particular stress on accuracy, rigidity, compactness, range and simplified operation. The spindle has a No. 40 Nat'l Std. taper, with a q.c. nut for quick interchange of tools, and the quill, which is counterbalanced, is provided with accurate means for gaging depth up to four positions. An ample range of feeds insures efficient use of modern cutting tools on a wide variety of hole diameters, regardless of the material being bored.

The table and saddle slide on hardened steel, inverted V-ways. Their weight holds them in accurate alignment without resort to gibs, and equalizing clamps lock them securely without distortion. Precision measuring screws, with lead accurate to within .0001" in any one inch and .0002" within any 12 inches, are equipped with large diameter micrometer dials and verniers graduated to .0001". Sturdy 5-pitch measuring screws move the table .2000" per revolution; however, since the micrometer dials are numbered from 0 to 100 on each half of the periphery, their operation is tantamount to the use of a 10-pitch screw.

Metered circulation, with an aspirator pump in the line which prevents oil leads at the spindle nose, provides efficient lubrication to most running parts, including the hyper-precision spindle bearings.

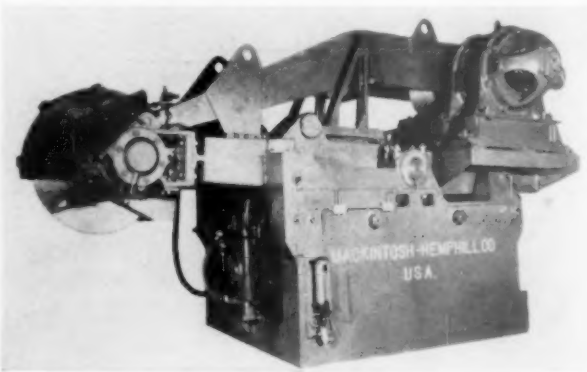
Internal Gear Shaving Machine

DEVELOPED IN response to the increasing demand for an internal rear shaver for automatic transmissions, speed reducers, home appliances and similar mechanisms, the **RED RING GEAR SHAVING PROCESS** developed by *National Broach & Machine Co.*, Detroit, produces gears of superior finish and high accuracy. Since compensation for fine distortion and other errors in hardened gears may be made in the shaving process, it frequently removes the necessity of expensive finish grinding or lapping. When lapping is necessary, shaving reduces stock removal by this operation to a minimum, and thus cuts production time materially. It operates on the proven Crossed Axes Gear Shaving Principle.

A fast simplified loading process and semiautomatic clamping and ejection mechanisms make possible high production with unskilled labor. For example, floor-to-floor time is 70 seconds on a 6" diameter by 1" face gear. Rigidity of the machine permits high feeds and speeds, and change of set-up can be made in 15 to 30 minutes. Other features are easily set automatic feeds and power traverse of the cutter and head slide to completely clear the work spindle for loading and unloading.

Tilting Hot Saw

COMPACTNESS for installation in limited space, and simplicity of operation, are features of the new 50" tilting **HOT SAW** produced by the *Mackintosh-Hemphill Company*, Pittsburgh. This saw, the first of which was delivered to Cia Siderurgica Belgo-Mineira, Brazil, is powered by a 150 HP motor through V-belt drive and has a peripheral cutting speed of 22,000 f.p.m. It is particularly adapted for cutting billets, rails and similar types of sections.



New Pratt & Whitney 1¼" x 18" Full Automatic Centering Machine

Pratt & Whitney, Division Niles-Bement-Pond Company of West Hartford, Conn. has announced a new 1¼" x 18" **FULL AUTOMATIC CENTERING MACHINE** capable of producing accurate, properly centralized and lined-up center holes simultaneously in each end of a piece of stock. Except for initial setup, the machine can be handled by unskilled labor, requiring only keeping the magazine supplied with work and taking away centered parts and caring for the ordinary center drills used.

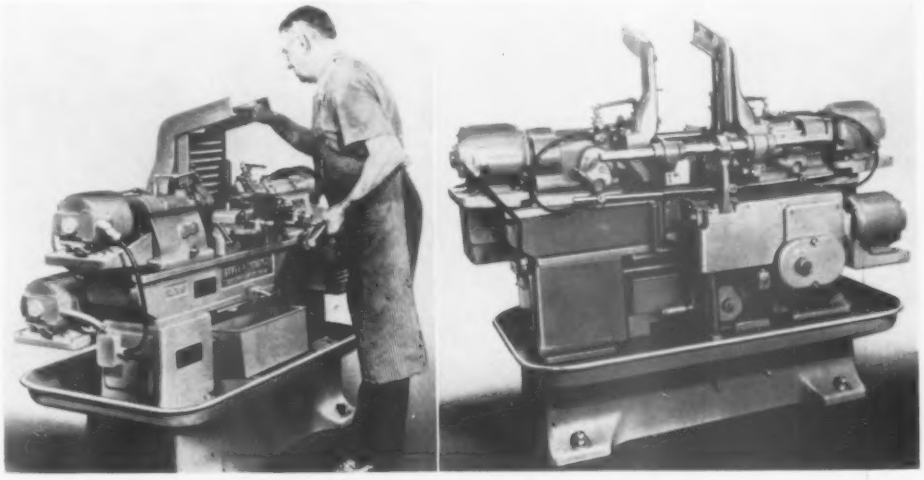
Both ends of the work are centered in one operation, with the drills being fed in conjunction with a full automatic work handling mechanism. The drills are withdrawn twice during the operation, to clear out chips and permit oil to enter the drilled holes. The cam path controlling this feed is arranged in three steps so that, after each withdrawal, the center drills go in to a greater depth. Full depth is reached at the last advance. The magazine, which is adjustable to accommodate work from ⅜" to 1⅜" diameter, and from 3½" to 18" long, holds the work and allows it to feed down by gravity to transfer slides. A compensating arrangement on the V jaws automatically takes care of small variations in work diameter. These jaws also may be adjusted to drill holes out of center on one or both ends, such as short oil holes, or holes for the driving pins used in grinding.

The work transfer slides, magazine uprights and the work holding V blocks all are mounted on bases which can be adjusted to any desired position on the bed, and clamped positively in position. The entire automatic mechanism on the rear of the bed is driven by a ½ H.P. foot-mounted motor.

The machine is equipped with pushbutton control convenient to the operator's right hand; however a crank is provided for conveniently moving the entire mechanism by hand during setting up operation.

The length of stroke of the drill spindle can be varied from ⅜" to 1¼", and the maximum countersink diameter is ⅝". Stops are provided to limit the forward movements of the drill spindles. These stops meet either of two conditions: They can be set to bear against the end of the work, and so hold the centering depth to a predetermined dimension; or they can be reversed so that they engage lugs on the drill head casting. This limits the forward movement of the spindles and brings the center holes the same distance apart, regardless of variations in the length of work.

The machine, which is a precision tool in every sense of the word, is supplied with change gears which provide four different camshaft speeds of 2.9, 4.3, 6.1 and 9 cycles per minute. Two sets of collets, 3/10" and 7/16", are provided—while other sizes are available on special order. The machine occupies a floor space of 72" x 34" and is 54" high, and weighs approximately 2,000 pounds.



Motor Driven Dust Collector

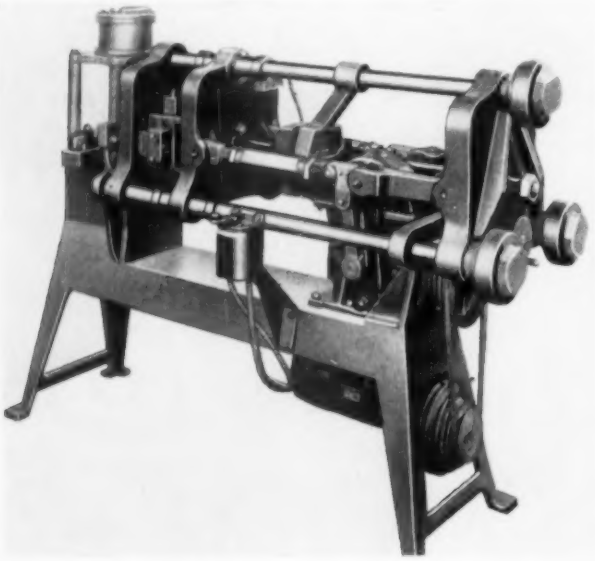
The Standard Electrical Tool Company, Cincinnati, have added to their "Air-rester" line a new belted motor-driven **DUST COLLECTOR.** Designed primarily for 25 cycle current, but is also available for 60 cycles, the new "Air-rester" is a compact, efficient unit used for collecting of dust from all types of grinding, buffing and polishing machines. The lower compartment contains the suction fan with motor, while the ample size dust collecting chamber is located on the top of the stand. The dust collecting chamber is fitted with filtering pads for arresting the dust and allowing the exhausted air to leave the stand without perceptible dust, at low velocity and without creating any objectionable draft or air movement. There is a convenient clean-out door at the side.

Pneumatic Air-Speed Saw Available

Designed to simplify and speed up sawing and filing operations, an **AIR-SPEED SAW** distributed by the *Air-Speed Tool Co.,* 1028 W. Slauson Ave., Los Angeles 44, Cal., can be worked advantageously in difficult positions. An adjustable barrel readily permits circular sawing in metals or woods, as well as difficult "dead end," keyhole or scroll work. Perfectly balanced for ease of handling and weighing only 3½ pounds complete, the new tool features finger tip speed and power control, and a simple cutting stroke adjustment of from ¼" to 1¼".

Light Die Casting Machine

A LOW PRICED **DIE CASTING MACHINE,** for the production of small zinc, tin and lead alloys, said to operate on a principle different from that of any machine previously made, is being built by *Light Metal Machinery, Inc.*, Erie, Pennsylvania. The machine has four operating speeds—266, 400, 639 and 882 shots per hour—predetermined by the size and weight of the casting being made, and maintained with virtually no variance in continuous, 24-hour-day production. Casting cycle is completely automatic, with die movement, injection and ejection all actuated by one extremely simple mechanism.



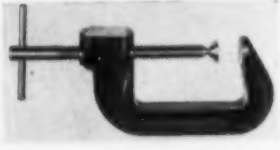
Because of these extremely high cycling speeds, castings can be made in a single cavity die at production rates claimed equal to or superior to those of large machines, and without sacrificing speed of production. However, multiple-cavity dies have proved quite practical, as evidenced by a number of jobs that have been run successfully on four and eight-cavity dies.

The machine is small and compact, requires a comparatively small space and operates with either air or hydraulic pressure on the injection plunger. On the standard model, the plunger diameter is 2 inches, its stroke is 4 inches, shot capacity is 18 ounces, casting area is 30 square inches, and injection pressure is 1000 psi if an air cylinder is used, or 2000 psi with a hydraulic cylinder.

Full details of manner of operation may be had from the maker at 607 Ariel Building, Erie, Pa.

New Automatic Clamp

A NEW **CLAMP,** with automatic engagement and release mechanism, is being produced by *Rapid-Titan Manufacturing Co.*, Grand Rapids, Mich. Distribution is through Michigan Distributors, Inc., also of Grand Rapids. The new clamp retains the positive action of a conventional "C" clamp by means of a floating nut with "cam-wedge' 'action which engages the screw threads when pressure is applied. Release does not become operative until all pressure has been relieved, thus insuring positive clamping where vibration would tend to loosen the conventional type. Quick action, plus stability, are claimed to effect substantial time savings on operations requiring clamps.



Pressure Sensitive Device

UTILIZING the principle that the electrical characteristics of a wire filament change with a physical strain, a pressure sensitive device developed by the *Baldwin Locomotive Works' Southwark Division* promises to open entirely new fields of measurement and control.

Called the**SR-4 PRESSURE SENSITIVE DEVICE**, the new instrument is used to convert gas or liquid pressure to electrical energy for measuring, recording or controlling. Its extreme accuracy (one-fourth of one per cent of full scale having been consistently obtained) implies that the device can be used for control operations that heretofore have not been possible. It is available in several ranges up to 0-to-20,000 pounds per square inch.

Essentially an electronic device, it will enable results to be transmitted long distances whether for direct reading, recording or control. Transmission even by radio is feasible which, it is claimed, will eliminate the leakage and clogging troubles in conventional capillary tubes used with other pressure sensitive instruments.

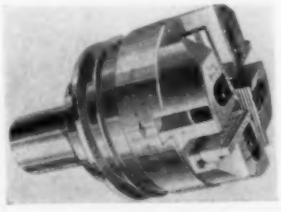
As its name implies, the SR-4 Pressure Sensitive Device is based on the principle of the SR-4 strain gage which in the five years since its introduction, has proven itself highly efficient in giving engineers accurate information on the strains and stresses of materials and structures under actual load conditions.

Among industries where the device should prove applicable would be steel mills, refineries, hydro-electric plants, oil well operation, gas and oil pipe lines, filtration plants and other public utilities, chemical plants and processing plants such as paper mills, food processing and plastics.

Landex Improved Die Head

The Landis Machine Company, Waynesboro, Pa., announces an improved Landex Hardened and Ground Die Head for use on Automatic and Semi-Automatic Screw Machines. The new-head—**TYPE LL LANDEX,**—supersedes the Type L Head and has several features which assure more dependable service and greater thread accuracy.

The major improvement is the use of latch blocks, which are positioned in the adjusting ring and which take the place of the locking ring in the Type L Head. The latch block abutments are readily reground after they have become worn in service, making a quick and economical means for repairing the die head. This has the advantage that the abutments contact the back face of the closing ring in latching the head in the closed position, and as the die head is adjusted for different diameters the latch blocks are continually using a different position on the abutting surface of the closing ring. The result is that wear of any appreciable amount is extended over a considerable length of time.



The type LL Landex Head, now available in the 5⅛" and 7⅛" sizes, comprises four major parts whereas the Type L had five. Chaser holders are interchangeable with the chaser holders for the L Type Head.

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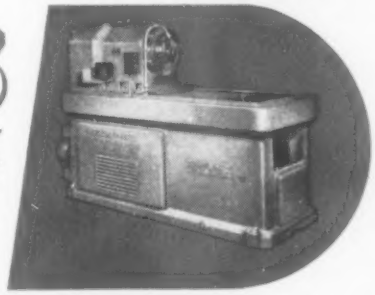
NUMBER 1

A compact machine requiring less than 9 square feet. Threads and mills up to 3" I. D. or O. D. Electronic feed and speed control. Control panel may be mounted on floor, wall, or ceiling.

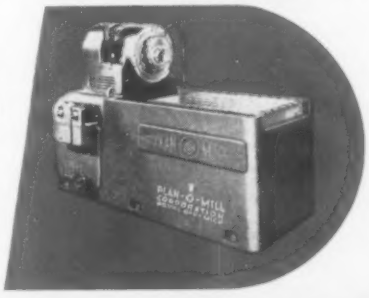
NUMBER 3

Threads and mills up to 8" I. D. or O. D. depending on amount of cut. Electronic feed and speed control with built-in control panel. Overall length: 75¼". Overall width: 37".



NUMBER 5

Threads and mills up to 20" I.D. or O.D. depending on amount of cut. Hydraulic feed and speed control. Overall length: 87". Overall width: 55¾".



PLAN-CO

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Years of on-the-job milling experience enable Plan-O-Mill engineers to design and make milling cutters of exceptional quality and performance. Available both in standard and special forms and sizes. Precision inspected with the most modern gaging equipment. For more parts per grind, more grinds per cutter, specify Plan-Co Cutters.

FREE DATA SHEETS FOR PRODUCTION PLANNING

As an aid to industrial executives in planning new or expanded production, Plan-O-Mill offers a set of three production planning data sheets. Each sheet contains scale plan views of a Plan-O-Mill machine (which may be cut out and positioned on your factory floor plan), together with complete specifications. A set is yours upon request.

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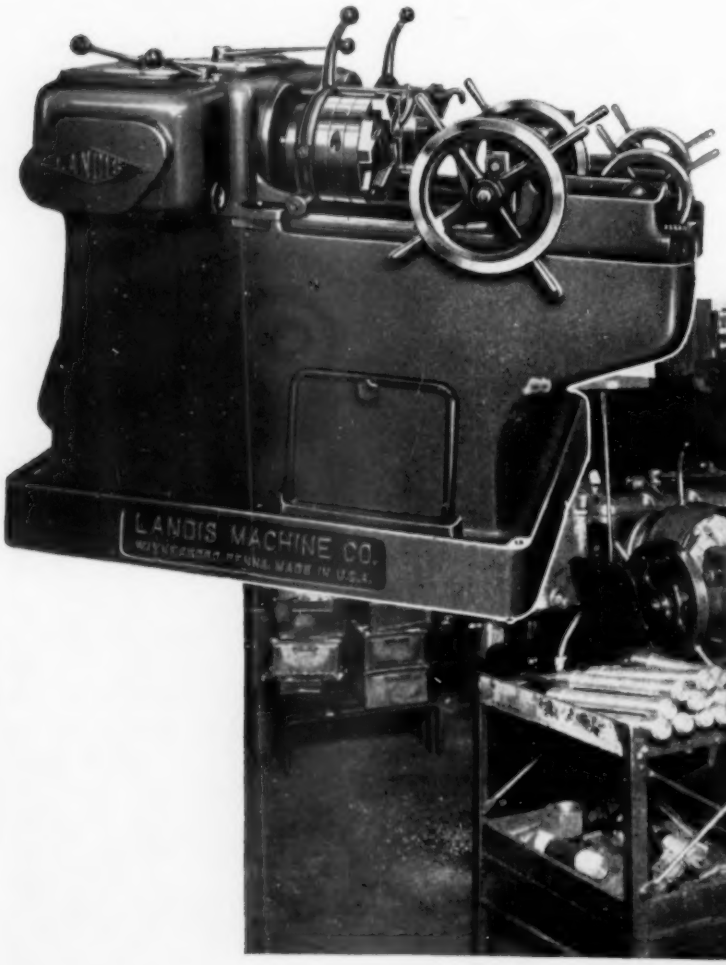
THE LANDMACO *Threading Machine*

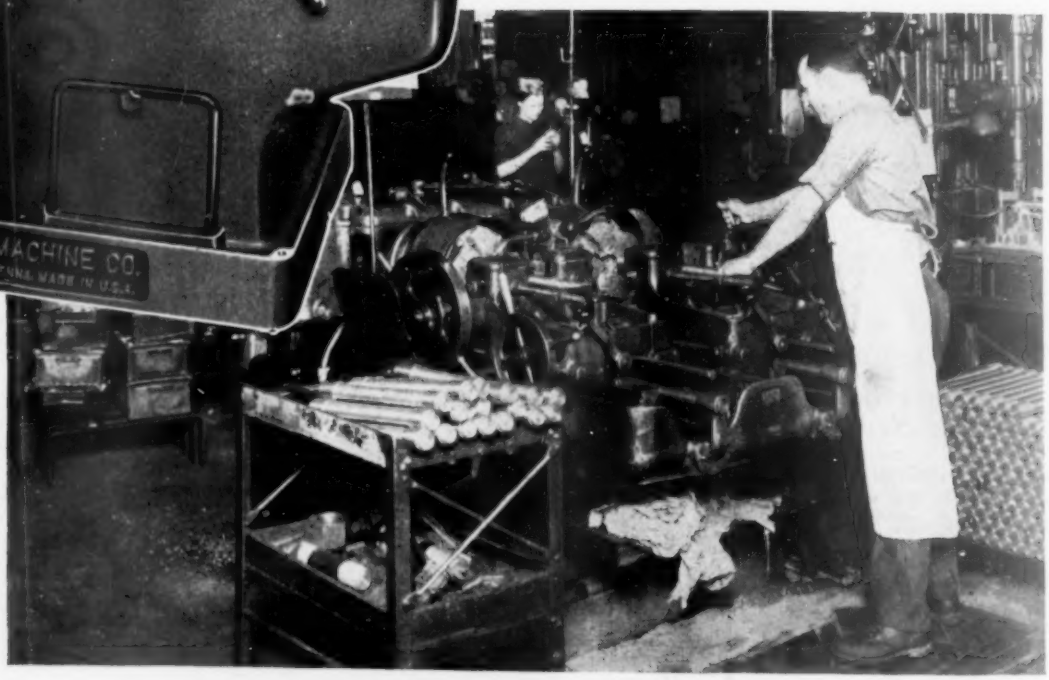
Assures the Fine Threading Accuracy Required for Diesel Engine Studs

Cylinder Head Studs of the Diesel Engine are made from heat-treated alloy steel and present a difficult threading operation. The threads must be held to extremely close tolerance specifications.

Manufacturers of these parts using Landmaco Threading Machines have no difficulty in meeting the specifications.



To the left is shown the Double Head Landmaco Threading Machine. Below, the same machine in operation, threading Diesel Engine Studs.



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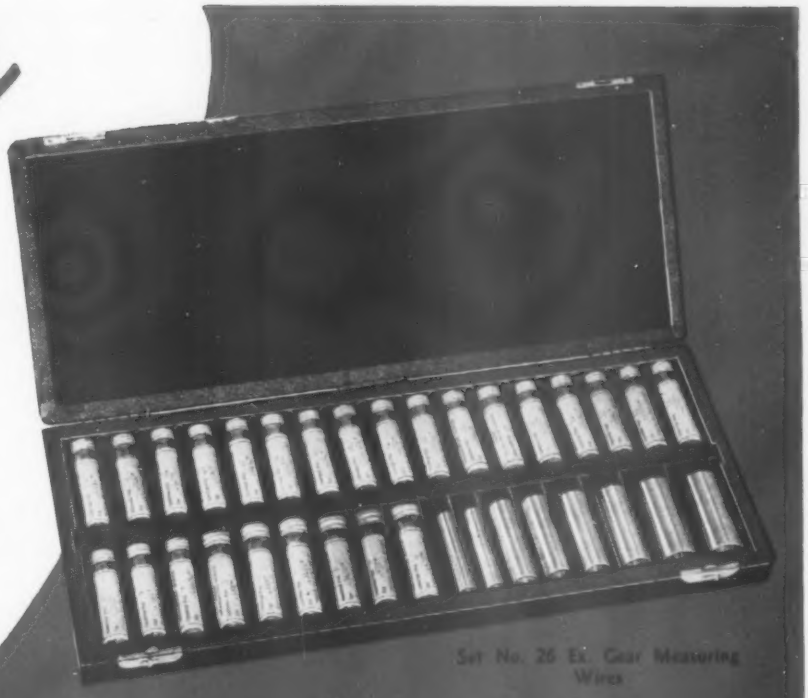
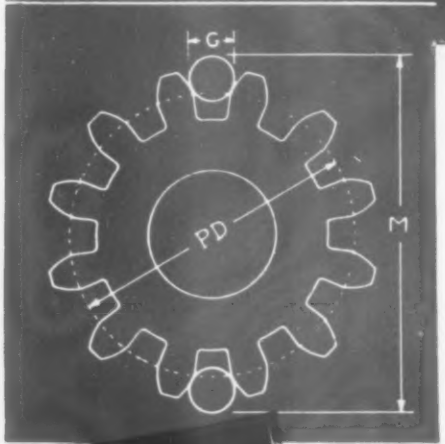


Set No. 26 Ex. Gear Measuring Wires

...provides GREATER ACCURACY...and SIMPLIFIED CALCULATIONS



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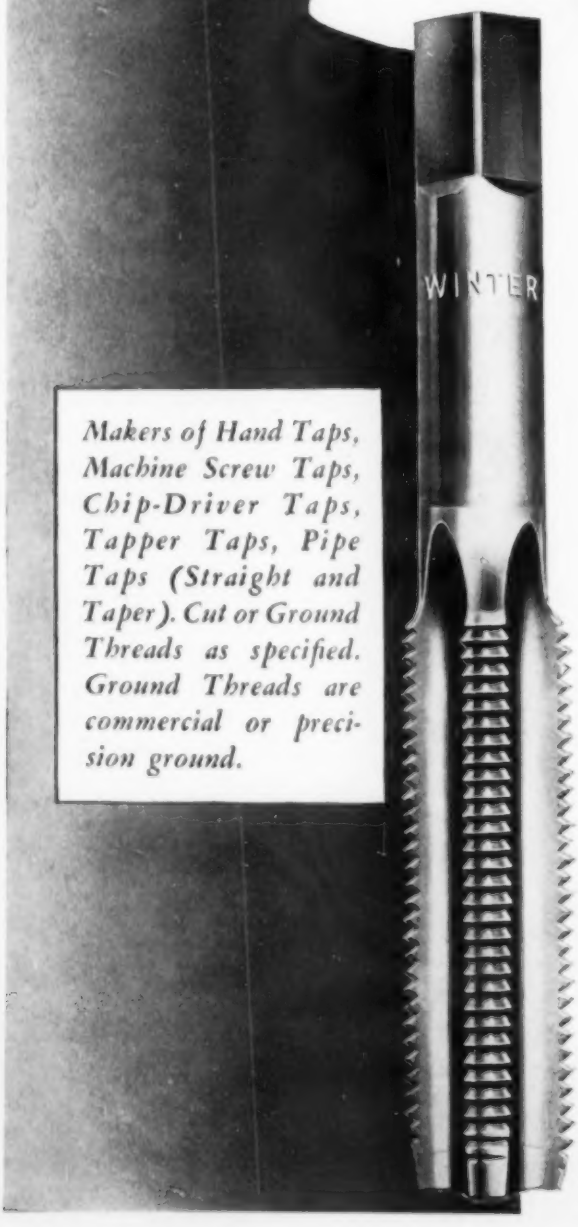

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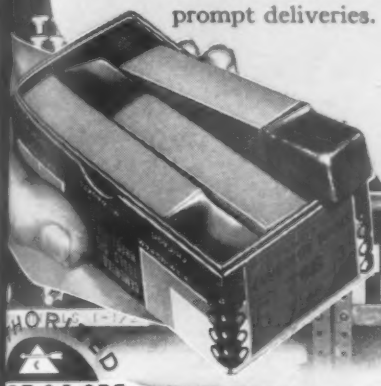

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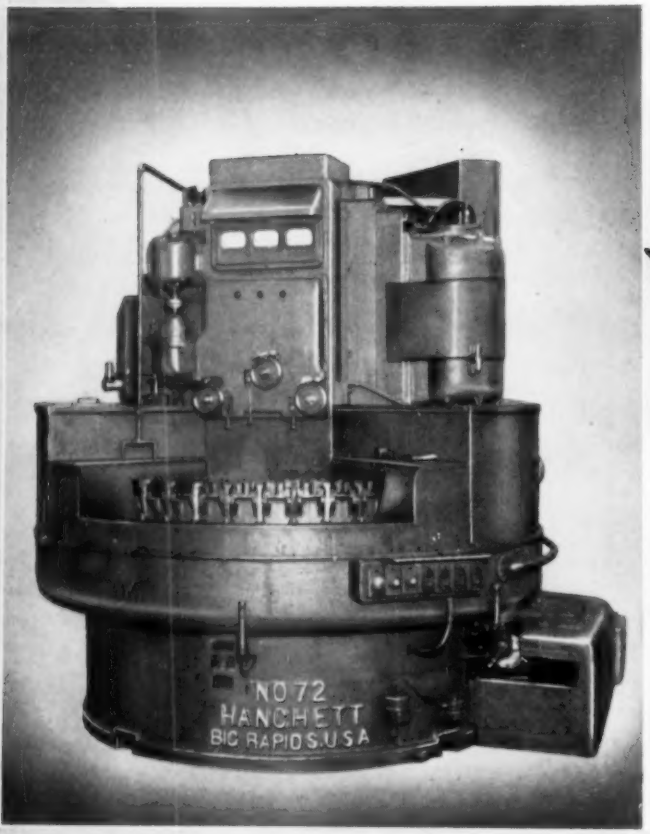
When 1 + 1 = 3 !

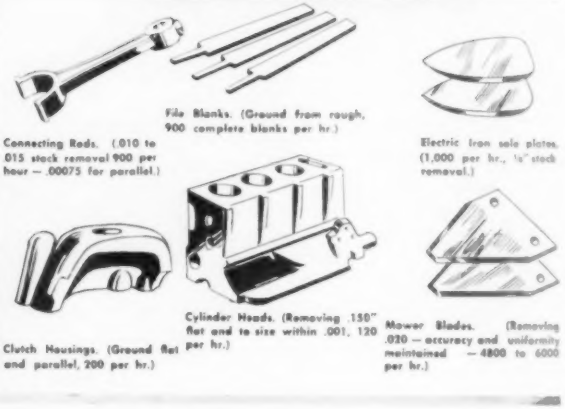
1 SET-UP ON 1 HANCHETT "72" CARRIES WORK THROUGH 3 GRINDING OPERATIONS . . .



ROUGH . . SEMI-FINISH . . FINISH

All in One Pass

An efficient, three-phase cycle that puts precision surface grinding on a really high-production level! Note the variety of work handled by the Hanchett 72 — see how your own production grinding can be simplified!



Connecting Rods. (.010 to .015 stock removal 900 per hour — .00075 for parallel.)

File Blanks. (Ground from rough, 900 complete blanks per hr.)

Electric iron sole plates. (1,000 per hr., ⅛" stock removal.)

Cylinder Heads. (Removing .150" flat and to size within .001, 120 per hr.)

Clutch Housings. (Ground flat and parallel, 200 per hr.)

Mower Blades. (Removing .020 — accuracy and uniformity maintained — 4800 to 6000 per hr.)

The Hanchett 72 is a truly high production surface grinder. Three vertical grinding spindles remove rough stock, smooth off the surface and give the work a finish to precision tolerances — in the time an ordinary grinder would use for only one of these operations! Work sizers mounted after each wheel automatically check depth of cut and compensate for wheel wear. Ammeters on each spindle keep operator informed of grinding efficiency and a light signals when wheels are worn. Push-button control station co-ordinates all operator movements — the problem of human error is practically eliminated when you turn over Production Surface Grinding to a Hanchett 72!

Get complete information about the Hanchett 72. Write today for Bulletin 141-3TL

HANCHETT GRINDERS — BIG RAPIDS MICHIGAN

IF IT'S A FLAT SURFACE—THERE'S A HANCHETT TO GRIND IT

HANCHETT MANUFACTURING CO.

BIG RAPIDS, MICHIGAN U.S.A.

HANCHETT HERMETI-COIL MAGNETIC CHUCKS

VERSATILITY that *Exactly* meets your needs in MACHINE TOOLS

Machine tool design is set free from a host of limitations when Vickers Hydraulic Controls and Drives are used. With no difficulty at all, the designer has an extremely wide choice of feed rates, traverse rates, RPM, sequence of motions, accelerations or decelerations, and thrusts.

Practically any machine tool can be designed *and built* to do *exactly* the required job by using Vickers Hydromotive Controls in one of the infinite number of combinations provided by more than 5000 standard Vickers Units.

In addition, positive overload limitations can be built into any machine—definite safety factors provided for both the machine and the operator.

Only Vickers Hydraulic Controls provide *all* the advantages of hydraulic operation—including exceptional compactness and reliability.

Let Vickers Application Engineers consult with you on your new designs.

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VICKERS Hydraulic CONTROLS and DRIVES

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

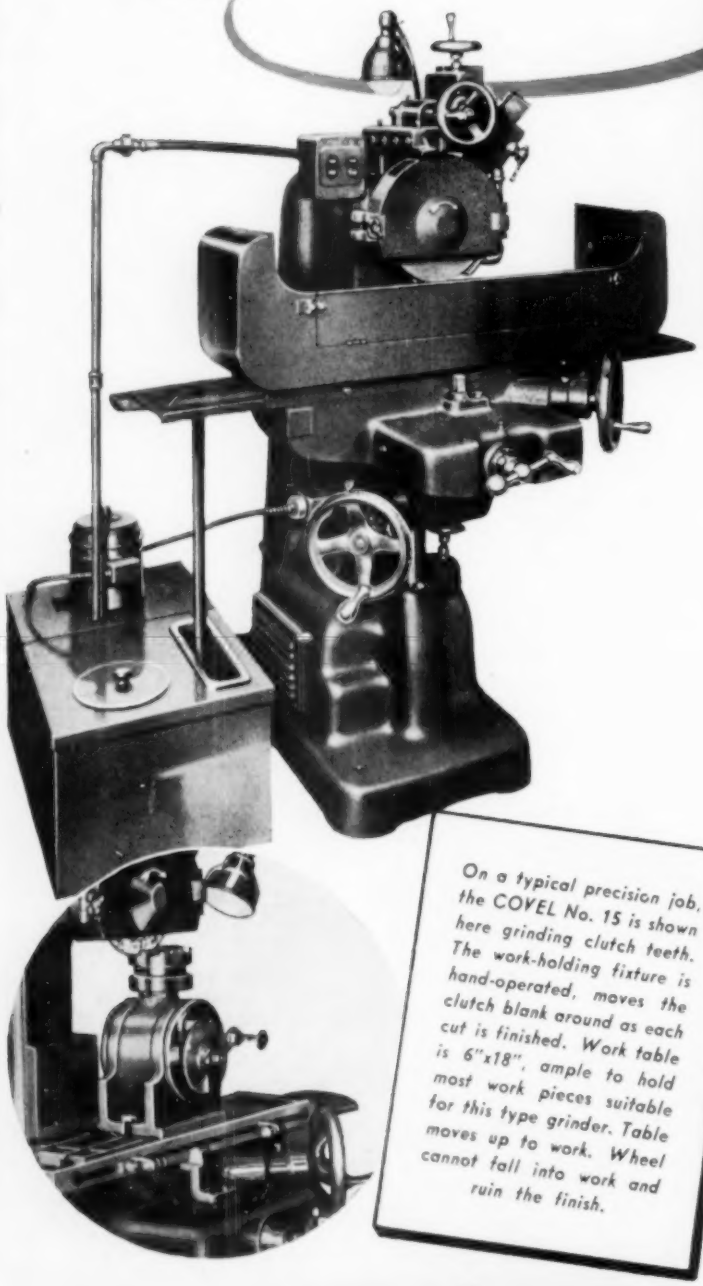
Versatile . . .

FOR BOTH PRODUCTION AND TOOLROOM JOBS!

That's the

COVEL No. 15 SURFACE GRINDER

(6"x 18")



On a typical precision job, the COVEL No. 15 is shown here grinding clutch teeth. The work-holding fixture is hand-operated, moves the clutch blank around as each cut is finished. Work table is 6"x18", ample to hold most work pieces suitable for this type grinder. Table moves up to work. Wheel cannot fall into work and ruin the finish.

Most plants today need a hand-feed precision Surface Grinder built for double duty—on the production line and in the toolroom. And that's the spot the COVEL No. 15 is designed to fill!

Quick set-ups and simple hand control reduce operating time to a minimum. Change-over from one job to another can be made quickly and easily—a feature that means bigger profits on short runs for you!

Toolroom savings result because of the wide range of uses and accuracy of the COVEL No. 15. Tolerances of tenths of thousands are everyday standards for this reliable machine—your assurance of precision workmanship on such intricate work as dies, threading chasers, V blocks and angular bars. Find out more about this versatile Surface Grinder and how it can pay its way in your plant. *Write for Bulletin T125 today.*

GRINDING MACHINERY SINCE 1874

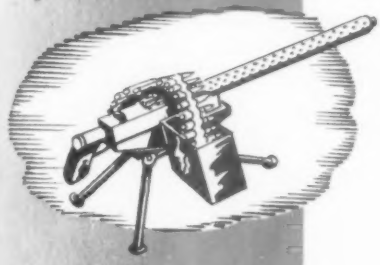
COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

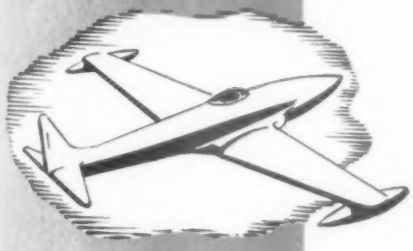
Broaching's WAR-PROVED EFFICIENCY CAN HELP YOU NOW!

When the finishing of grooves in pistol frames was changed to broaching, one broaching machine and one operator replaced six machines and six operators . . . yet production was greatly increased. The result was faster production of a better gun at lower cost.

The engineers of one large plant producing Garand rifles figured savings at $397,623 in capital investment, $266,000 per year in wages at $1.00 per hour, 2000 square feet of floor space, plus the lessened maintenance cost of fourteen machines that did the work of 111 machines formerly used.



Machine gun barrels were changed from rifling with many passes by a single point tool to broaching in one pass. In one instance, out of nearly 19,000 barrels produced only 41 were scrapped, a reduction of 97% from average scrap loss.



The intricate "Christmas tree" that fastens the blades to the rotor in a jet engine must be accurate to the closest limits. To produce this odd and difficult shape to press fit tolerances, broaching and broaching alone was suitable.

THESE WAR-LEARNED LESSONS ALSO APPLY TO PEACE-TIME PRODUCTION

Faster Production . . . Greater Accuracy . . . Lower Costs . . . all of these things and more can be had in your peacetime production by applying the experience of Detroit Broach. Call in a Detroit Broach engineer and go over your production methods with him. He will give you complete production and cost figures on your own job. It costs nothing to get the facts. Call or write today.

MEMBER BROACHING TOOL INSTITUTE

DETROIT *Broach* COMPANY

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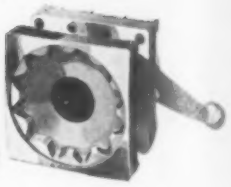
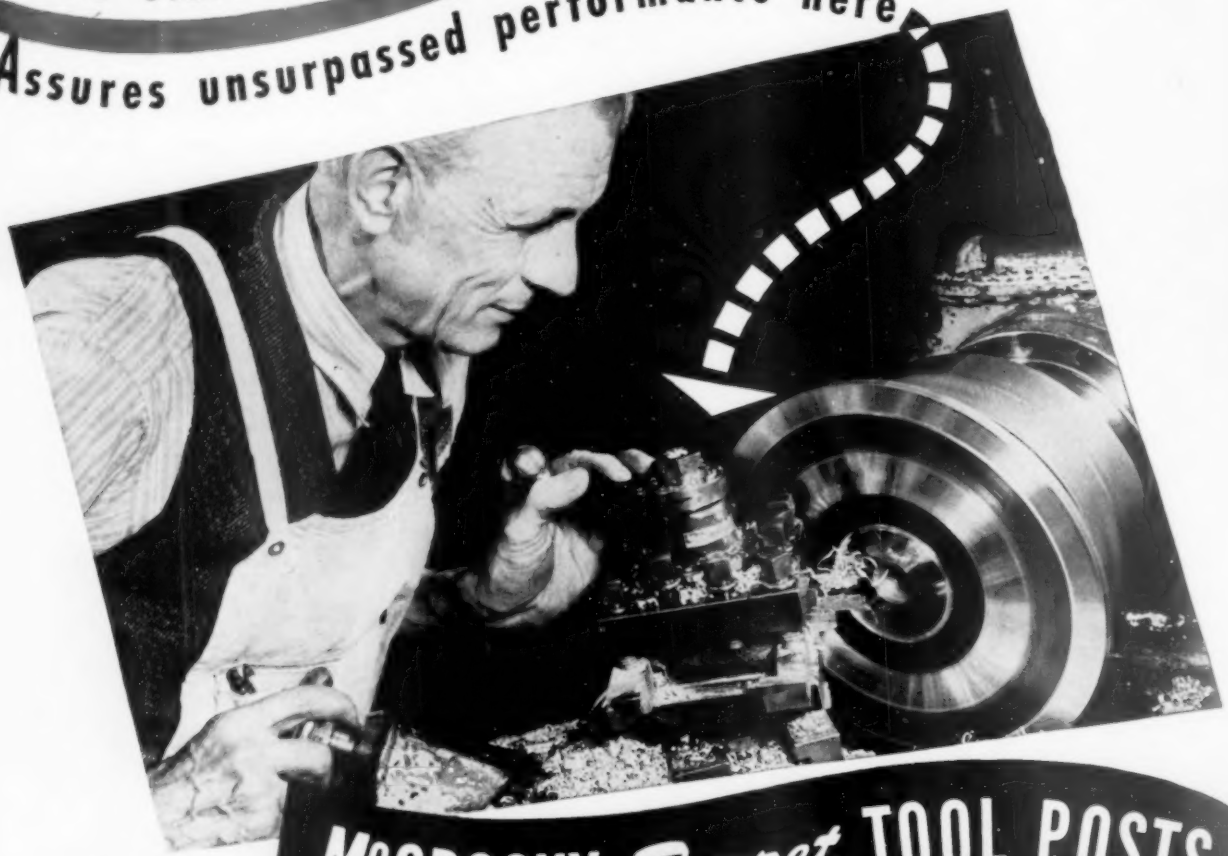
This time-proved construction here

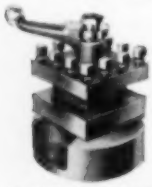


Assures unsurpassed performance here



McCROSKY *Turret* TOOL POSTS

Style "O" Turrets Mount in the T-slot.



Style "OL" Turrets Mount on the Bolt Circle of the Main Slide.

● Featuring a service-proved design conceived, perfected and available only from McCrosky, these tool posts give engine lathes the versatility of turret lathes. The indexing corrugations on the post and body, with their long shore line of contact, are finished to extremely close tolerance on specially built machines. This construction provides the extreme rigidity needed to withstand the thrust of the cut—minimizes wear—and assures easy, extremely accurate indexing of successive tools into cutting position, without stopping for tool changes.

McCrosky Turrets are used by leading concerns from coast to coast. Endorsed by all well known lathe manufacturers. Furnished in five styles including square and hexagon designs. Nine different sizes. Write for catalog.

McCROSKY TOOL CORPORATION
MEADVILLE, PA.

COST CUTTING TOOLS

Designers and Manufacturers of

Jack-Lock MILLING CUTTERS
Block Type BORING BARS
Wizard CHUCKS AND COLLETS
Super Adjustable REAMERS
Turret TOOL POSTS

GORTON

SPECIALISTS FOR OVER 50 YEARS IN

Tracer-Controlled MILLING

Automatic Rotation PROFILING

* WORK and MASTER **ROTATE** with TABLE MOVEMENT

CYLINDRICAL Interrupter Cam for Gun-Fire Control

A Typical HIGH PRODUCTION Profiling Job—done on the Gorton 9-J Duplicator. 10 elliptical wells—no two the same size—on each of these cylindrical work pieces are rough and finish milled, with beveled edges—simply by combination of Tracer Control, with Automatic Rotation of work and master, geared to table movement—all controlled by one central lever motion.

Blank cylinders come to the Gorton Duplicator, finish-turned. The 10 wells are first rough milled to a depth of .052". Then a finish cut, with the same cutter and spindle speed, removes .010" stock, merely by lowering spindle the required amount. Hand finishing required is almost negligible—due to the excellent finish obtained by the use of 2-flute Tungsten Carbide form cutters—at Gorton high spindle speeds.

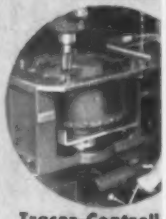
PRODUCTION DATA

Material—S.A.E. 1020 Seamless Steel Tubing.
Operation—Rough and Finish Milling of 10 Wells (varying from 3/4" wide x 3/8" long . . . to 3 5/8" wide x 2" long), .062" deep.
Cylinders—9 9/16" O.D. x 7 25/32" long.
Feed—Manual . . . Spindle Speed—4,000 r.p.m.
Tolerances—±.005".
Time—Roughing 18 minutes; finishing 23 minutes; total floor-to-floor, 43 minutes. (10 wells complete, average 4.3 min. per well.)

ENGINEERING SERVICE . . . FREE

Have the advantage of 50 years of Gorton Specialized Tracer Control Experience in your shop—call nearest Gorton dealer or write to Gorton factory at Racine, Wisconsin.

The Right S
The Right T
of Machine
for Every Job
From 2 oz. to 2
DIE BLOCKS



Tracer-Controll
MILLING

Tracer-Controll
DUPLICATING

Tracer-Controll
ENGRAVING

Tracer-Controll
ETCHING

GORTON ARMY E NAVY

GORTON Precision MACHINES

CUTTER GRINDERS
ETCHING MACHINES
2 & 3 Dimensional PANTOGRAPHS
Vertical & Universal Head Super-Speed MILLERS
Manual & Electric Control DUPLICATORS

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Company.....
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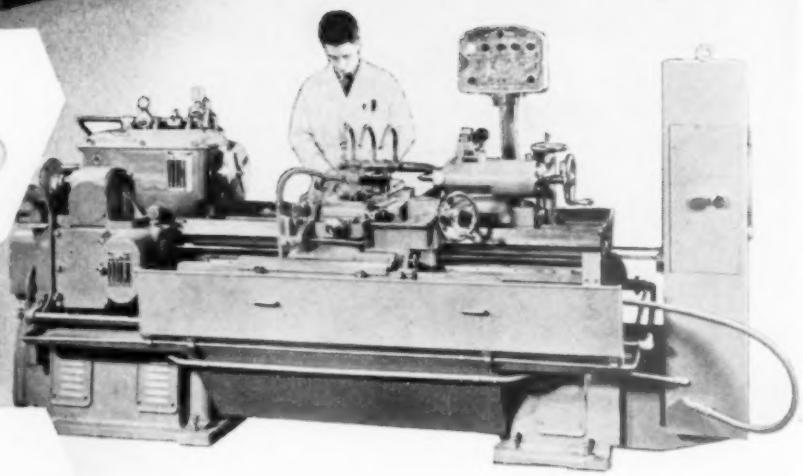
4 NEW FEATURES for faster, better, turning

ONE BUTTON

controls completely automatic operating cycle

QUICK SET UP

permits low cost automatic operation even on short runs



CONTROL PANEL

. . . within reach of operator's right hand

6 TO 1

spindle slow-down for use with rear carriage

ACCURACY · ECONOMY · LONG LIFE

Monarch
TURNING MACHINES

The redesigned Monarch Magna-Matic is setting new standards for low-cost, high-quality turning, even beyond those set up by the 10-year-proved former design. • It utilizes the lastest developments in all-electric controls and incorporates other important improvements gained from the illuminating experience of widely varied wartime production. • Every finished piece is perfectly interchangeable, whether from first or later runs, because it is gaged from a thin metal template. • For automatic or semi-automatic operation, no other turning machine can match the Monarch Magna-Matic. • Ask us for details and job analyses for faster, higher quality, lower-cost turning.

THE MONARCH MACHINE TOOL CO. · SIDNEY, OHIO

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THE BIG THREE

QUALITY Precision Built
DIES · FIXTURES · JIGS · GAGES
are

1. Engineered for maximum production capacity
2. Built Right
3. Priced Right

★ **THE BIG THREE** amount to a policy which we have maintained throughout 16 years of designing and building tools for industry.

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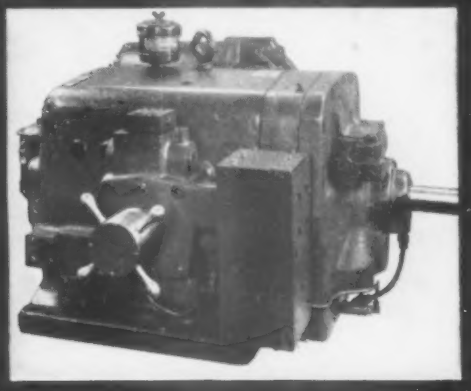
NORBIDE Gages are outwearing conventional measuring devices 200 times and more. Made of Norton Boron Carbide — "the hardest material made by man for commercial use" — NORBIDE Gages show exceptional resistance to abrasion and scratching. They will not pick up lint nor become charged with particles of metal and they are inert to chemicals employed where gages are used. NORBIDE blanks for plug, ring, snap and keyway gages and NORBIDE contact points for dial indicator gages can be obtained from your regular gage supplier. For an interesting booklet on NORBIDE Gages write for Catalog #1100 to:

NORTON COMPANY - WORCESTER 6, MASS.

NORBIDE is a Registered Trade-mark

Oilgear Fluid Power units of this type are the heart of cordite extrusion press performance.



For the SAFE Extrusion of Cordite

ARE YOU TRYING TO

1. Apply large forces through long . . . or short . . . strokes at variable speeds?
2. Obtain automatic work cycles, variable speeds in either direction . . . with or without preset time dwell?
3. Apply large forces through continuous or intermittent reciprocating cycles at constant or variable velocities?
4. Obtain extremely accurate control of either position or speed of a reciprocating member?
5. Apply accurately variable pressure either static or in motion?
6. Closely synchronize various motions, operations or functions?
7. Apply light . . . or heavy . . . forces at extremely high velocities through either long or short distances of travel?
8. Obtain continuous automatic reversing drives at constant R.P.M. or over a wide range of speed variation?
9. Obtain accurate remote control of speed and direction of rotation, rates of acceleration and/or deceleration?
10. Obtain constant horsepower output through all or part of a speed range?
11. Obtain automatic torque control?
12. Obtain accurately matched speed of various rotating elements?
13. Obtain constant speed output from a variable speed input?
14. Obtain full preset automatic control, elimination of problems of shock, vibration, etc.?

You Need Oilgear!

THEY TURNED TO OILGEAR FLUID POWER

Far more powerful than TNT, cordite requires the utmost care in its extrusion. A shade too much pressure, a shade too much speed, a small infraction of cycle sequence . . . and unpleasant things will happen. Curbing this danger and meeting the increased wartime demand for cordite and rocket powders were problems solved by Oilgear engineers. Oilgear Fluid Power is now standard on cordite extrusion presses made by seven large manufacturers. Essential functions attained are rapid advance . . . preset automatic slowdown approach and shockless contact . . . automatic pickup in speed and pressure . . . preset maximum extrusion speed . . . automatic stop to dissipate energy . . . preset and rapid return plus important safety features.

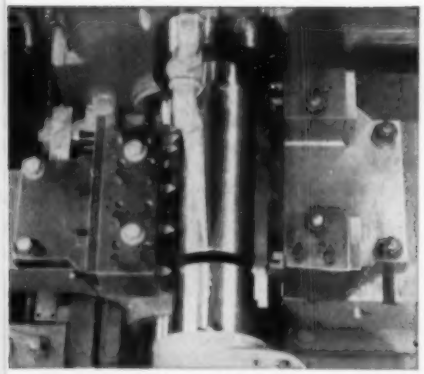
If your rotary or straight line power transmission problems demand exquisite speed and pressure control . . . or require unique functions . . . or present fire hazards and the like, *you need Oilgear*. Write for information now. THE OILGEAR COMPANY, 1308 W. Bruce Street, Milwaukee 4, Wisconsin.

OILGEAR

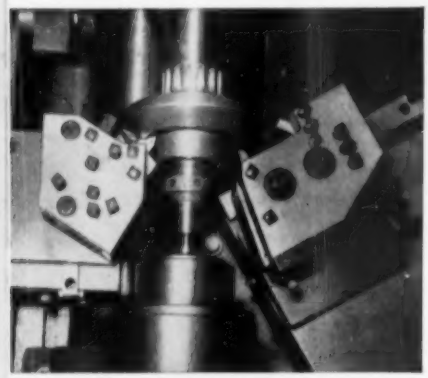
Fluid Power

AN AUTOMATIC LATHE

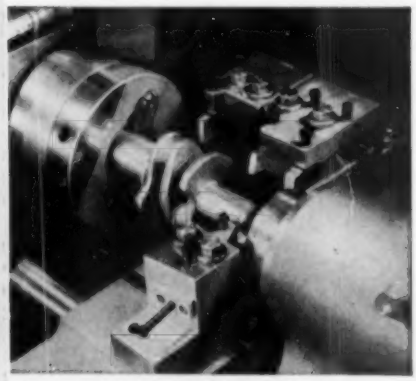
can be versatile too!



Machining Diesel cylinder liners. Automatic tool relief and fading out tool pressure at point of overlapping cuts, eliminates rings and grooves in the finished surface.



Bevel gears and other work having angular surfaces are machined without auxiliary slides, cams, taper attachments, etc., because rear slide can be set at any angle.



On crankshaft jobs like this, heavy turning and cheek facing with rough intermittent cuts are readily handled with real power and all-around rigidity.

THE GISHOLT NO. 12 HYDRAULIC

demonstrates it!

On this modern automatic lathe, independent hydraulic feeds are provided for front carriage and rear slide, assuring smooth constant feeds with an infinite selection from ".000 to .060." Both slides are heavy and wide, permitting ample room for substantial multiple tool blocks.

On the front carriage, the top slide is equipped with micrometer dial and screw for easy adjustment of tools. Simple cam plates may be applied to the carriage support bar for special contour and taper turning. Rear slide may be set in any position for facing, turning or machining of angular surfaces.

Slides feed against and dwell at positive dead stops, insuring utmost precision. Elimination of feed gears, mechanical trips, cams, etc., greatly simplifies changes of set-up.

GISHOLT MACHINE COMPANY

1257 E. Washington Ave. • Madison 3, Wisconsin

Look Ahead . . . Keep Ahead . . : With Gisholt Improvements in Metal Turning

URRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

We don't guess —we must know!

ALL MATERIALS that go into Woodworth gages are tested in one of several specially built wear-test machines developed by the N. A. Woodworth Company to supplement its ultra-modern laboratory facilities.

To insure long-lasting precision hundreds of materials—from glass to beryllium copper—have been checked to prove wearability. *We don't guess—we must know!*

The test machine operates with a combined rotary and reciprocating motion, to simulate exactly the "wringing" effect of a gage in actual use. At the same time, pressure is applied against the wearing surface of the gage, thus creating friction. Woodworth test gages are subjected to punishing wear-tests as high as 350,000 cycles, each cycle consisting of an up and down stroke.

And then—each gage must pass rigorous tests in our own high production plants for accuracy and wearability. *We don't guess—we must know!*

Woodworth precision gages and tools—designed to give users the longest accurate service life at the lowest possible operating cost—will help industry build the finest peacetime products this nation has ever known.

★ ★ ★

Close-up showing test gage reciprocating under pressure between wear blocks.

THE WOODWORTH WEAR TESTER

PATENT U. S. A. NO. 2362554 CANADA NO. 426441

ACCURACY YOU W CAN TRUST

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N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD • DETROIT 20, MICHIGAN

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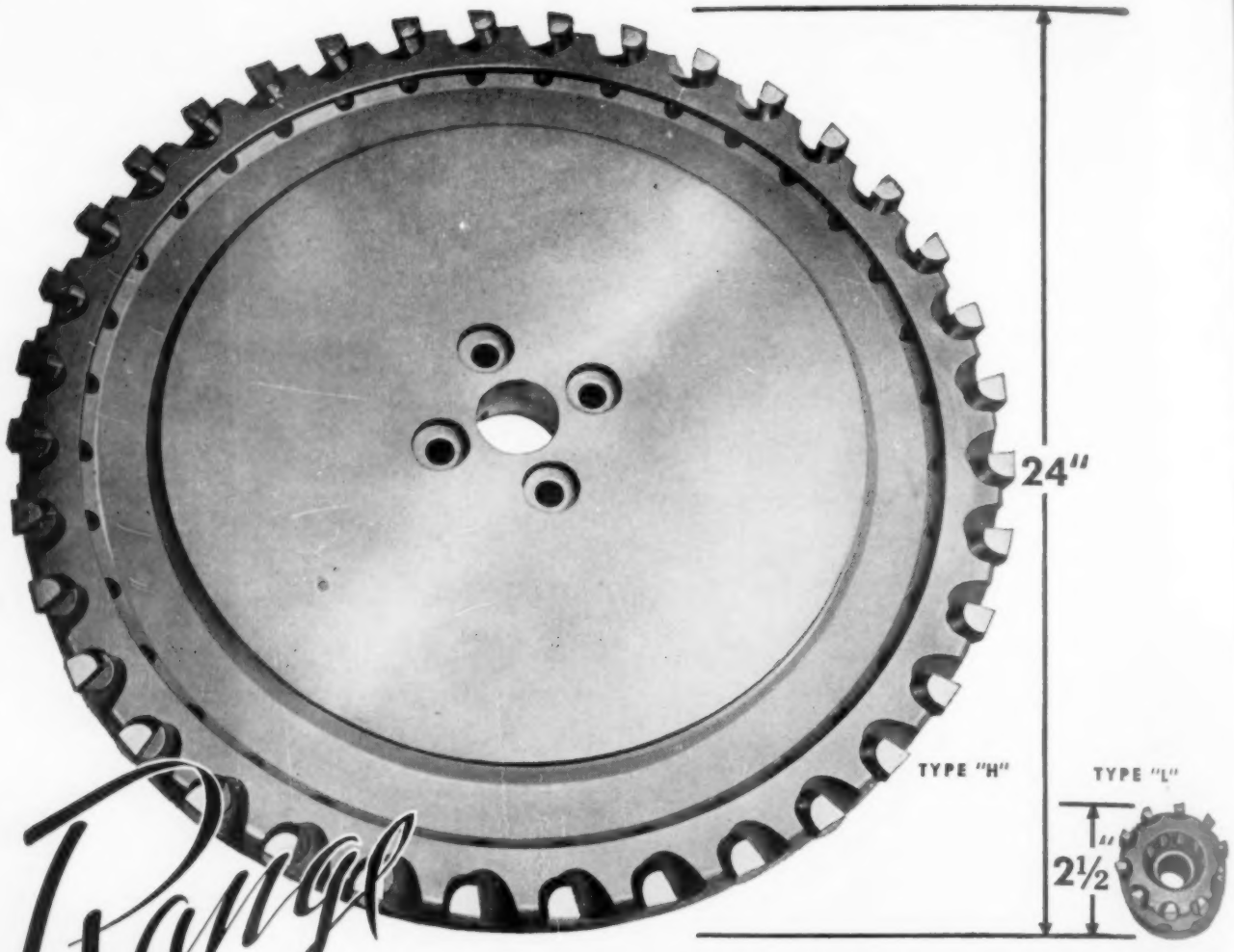

Rangel

TO MEET PRACTICALLY ANY MILLING JOB ...WILL BE FOUND IN THE LOVEJOY LINE

From the tiny Type "L" cutter to the giant Type "H", you will find a range of Lovejoy *positive-locking* Milling Cutters to meet practically every production requirement. And every one uses *standard* Lovejoy blades that are available *from stock*.

All the standard types and sizes are illustrated in the new Lovejoy catalog. Here you will find detailed descriptions of the cost-cutting features found in all Lovejoy inserted-tooth type tools. Here you will find tips on cutting, grinding, speeds, feeds, etc. Use the handy coupon for your copy — there is no obligation.

If your work requires special cutters, call on Lovejoy for special designs — we have a background of nearly 30 years of experience that is available to help you. And don't forget Lovejoy's coast-to-coast service system for on-the-spot help. Write for your free copy of "Lovejoy Modern Metal Cutting Tools".

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TOOL COMPANY, Inc., SPRINGFIELD, VT., U.S.A.

MILLING CUTTERS | BORING HEADS | ARBORS | SPOT FACING TOOLS | COUNTERBORES | BORING BARS | SINGLE POINT TOOLS | TURRET TOOL POSTS

DIAMONDS IN A

New and Improved Vitrified Bond

A new vitrified bond designed expressly for diamond abrasive makes a lusty new champion in the grinding of cemented carbide tools and other super-hard substances! The Bay State line of diamond abrasives (resinoid bonded, excellent for many precision and form-grinding operations; and metal bonded, best suited for off-hand grinding jobs) is now supplemented by a new *vitrified* bond.

Considerable research and experiment, together with thorough testing in actual use, have proved the superiority of this Bay State development. Now, the unparalleled abrasive power of diamonds gains the advantages of vitrified bonding — great strength and rigidity, plus faster, cooler cutting action. Results are long life, hair-fine accuracy and lower grinding cost per tool — important additions to the already high economy and efficiency of diamond abrasive grinding.

Typically, Bay State makes available to you this latest achievement, in a wide range of standard shapes and sizes . . . every one of them built to uphold Bay State's record of *top performance consistently duplicated.*

Write for Bulletin #1980, containing full information on Bay State Resinoid, Metal and Vitrified Bonded Diamond Abrasives.

BAY STATE ABRASIVE PRODUCTS CO.
9 Union Street, Westboro, Mass.

BAY STATE

ABRASIVE PRODUCTS

Top Performance Consistently Duplicated

GRINDING WHEELS · HONING AND SUPERFINISHING STONES · PORTABLE SNAGGING WHEELS
MOUNTED WHEELS AND POINTS · CUT-OFF WHEELS · INSERTED-NUT DISCS · AND CYLINDERS

The "JO-BLOCK" Guards the Jewel of Accuracy

Right now, with the long-hoped-for post-war battle for business getting into full swing, the establishment of high standards of shop accuracy becomes all-important in thousands of plants.

Don't let the hurry of reconversion sidetrack this basic precaution. Protect the performance of your product—make assembly easier—provide parts interchangeability—with genuine Ford Johansson Gage Blocks.

Guaranteed accurate within .000002, .000004 or .000008 of an inch, plus or minus. Available in sets or individual blocks, with all accessories needed to establish and maintain true accuracy in your plant. Write for new Catalog No. 17 today.

Ford Motor Company, Johansson Division, Department 1612, Dearborn, Michigan.

Get Your New Catalog of Johansson Gage Blocks *and* Accessories—*Write Today!*

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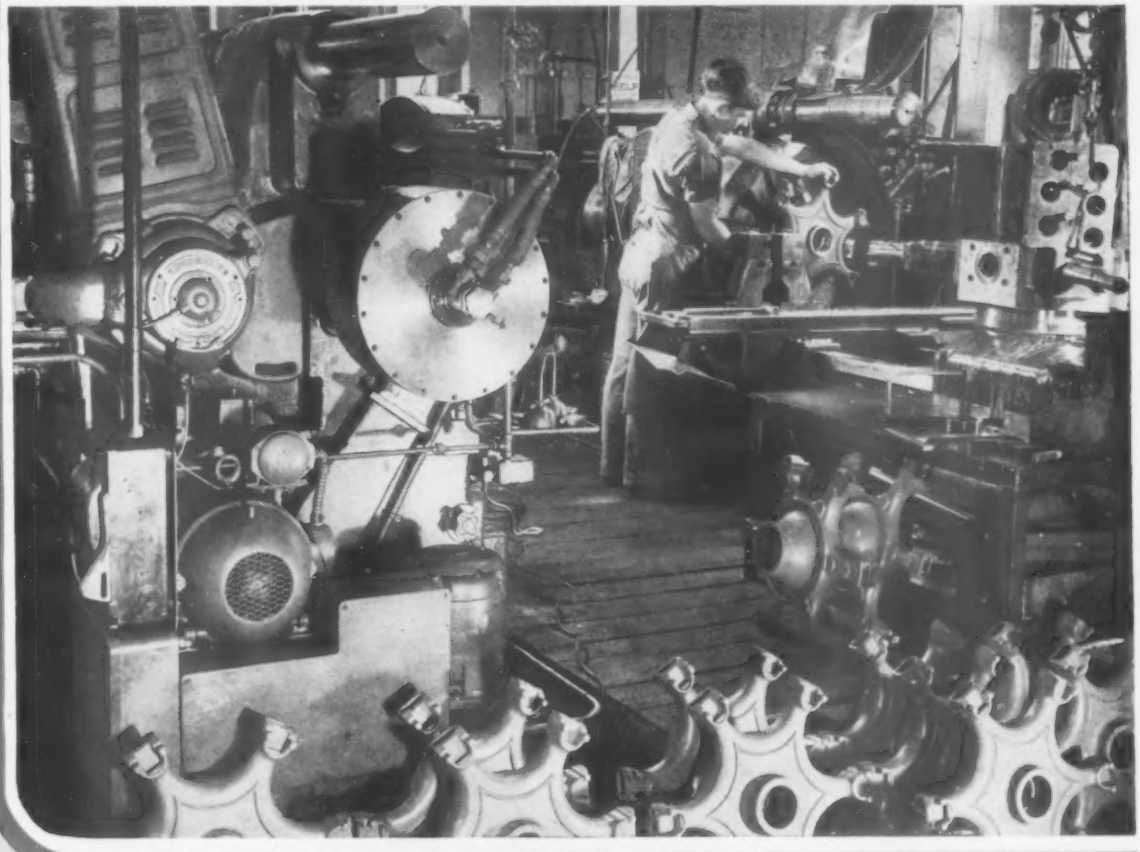
GAGE BLOCKS

CLARK EQUIPMENT COMPANY *makes minutes count with* P&J 6 DREL AUTOMATICS

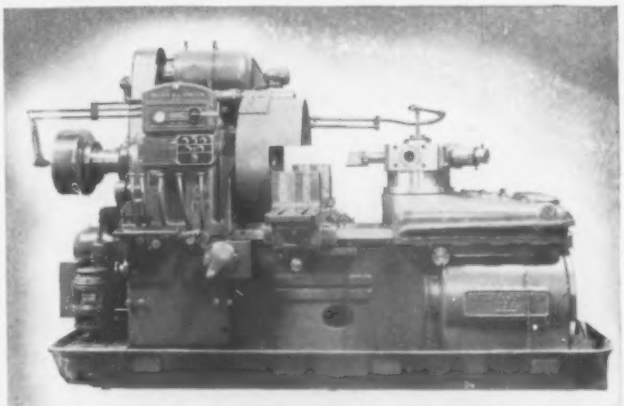


A combination of versatile tooling, power, rigidity and convenience in handling, inherent in P&J Automatics, has enabled the Clark Equipment Company, Buchanan, Michigan, to speed up the production of truck wheel spiders. An idea of the job being handled can be obtained from photograph taken of the operation.

If specific figures were permitted, they would show how the performance is outstanding in terms of time and quality of work and why the production executives of this plant are so very well satisfied with their P&J machines.

Potter & Johnston 6-DREL Automatics incorporate in their design features which assure great flexibility and high productive capacity. They make minutes count in duplicate parts production and thereby cut costs.

It will be to your advtange to consult P&J engineers on your chucking operations and get time estimates on handling them on P&J Automatics.



P&J DREL AUTOMATICS ARE DESCRIBED IN DETAIL IN BULLETIN 118, AVAILABLE PROMPTLY ON REQUEST.

POTTER & JOHNSTON MACHINE CO.

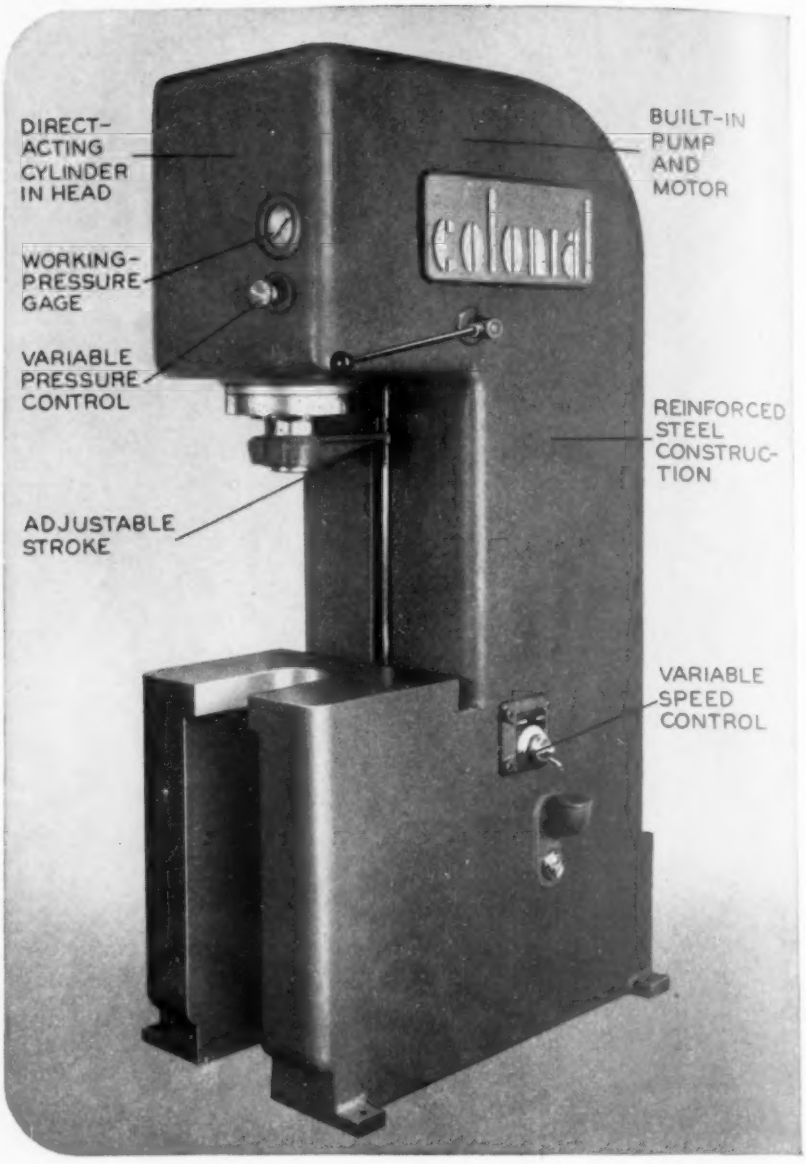
Pawtucket . . . . . R. I.

MORE BONDS WILL FINISH THE JOB QUICKER . . . BUY THEM NOW.

ANNOUNCING-----

Colonial

Hydraulic Standard ASSEMBLY PRESSES



Companions to Colonial's line of standard Broaching Presses and Straightening Presses, these ultra-modern all-hydraulic units are characterized by exceptionally smooth yet powerful action, due to use of the exclusive Colonial hydraulic pressure system, with direct acting cylinder built into the machine head, etc.

Capacities: 15, 20, 35, and 50 tons.

Stroke: Adjustable, 12 in. maximum.

Speed: Adjustable, 60 to 180 inches per min. max. on working stroke, 120 to 360 inches per min. on return stroke (depending on machine size).

Pressure: Infinitely variable, External adjustment. Pressure gage indicates exact pressure. Max. Press. 1000 to 1500 lbs. per sq. inch depending on size.

Floor Space: Only 29 x 50 inches on largest model.

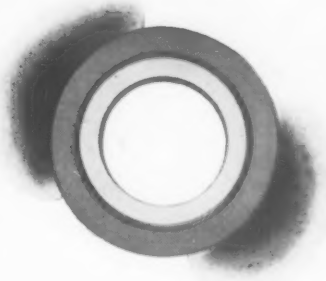
For Complete Details, ask for Bulletin PA-45.

colonial BROACH COMPANY

DETROIT 13, U.S.A.

Broaches Broaching Machines - Broaching Equipment

Goodbye Guesswork!



Many of the new precision standards demanded in war industry are certain to be carried on in peacetime production.

They are going to mean better machines, better appliances, for living and working.

These close tolerances can be maintained only through constant use of gages, to check both tools and finished parts.

Gages bearing the PM Diamond Emblem bring you initial accuracy and the perfection of finish that insures long wear.

Pipe Machinery carries in stock a large assortment of standard plug, ring and thread gages from which prompt shipment can be made.

And we shall be glad to quote you prices and delivery dates on special gages to meet particular requirements.

PMCO

ARMY E NAVY

The PIPE MACHINERY COMPANY Cleveland, O.

Inventory time or any time . . . MILNE

KOLORKOTE

saves you Time, Waste, Trouble

MILNE TOOL STEELS are identified by overall coatings of various lacquer colors sprayed the entire length of the bars. This method, developed by Milne, corrects the obvious disadvantages of the common practice of marking the bar ends.

KOLORKOTE offers these advantages to any manufacturer who keeps a stock of tool steel on hand:

1. **The grade can be readily identified, no matter how much has been cut from the bar, because the entire surface is completely coated with color.**
2. **Short ends of one grade of steel will not be misplaced with other grades. But if space is limited, they can be racked together without losing their identity.**
3. **Bar pieces retain their distinguishing colors in the machine shop, preventing errors.**
4. **Furnacemen know what grade they are working, and properly heat treat it, preventing spoilage.**
5. **Stock clerks can tell at a glance how much steel of various grades they have on hand, improving records and assuring much higher scrap values.**
6. **Wherever workmen do not understand English, brand names and labels mean little, but COLOR IS UNIVERSAL.**

KOLORKOTE adds a plus to the proved advantages of Milne Tool Steels for every metal cutting and forming need. **KOLORKOTE** wall chart, with exact colors, and heat treating information, free on request, from the Milne office near you.

A. MILNE & CO.

ESTABLISHED 1887

★ NEW YORK 14
741 Washington St.
★ BOSTON 9
109 Broad St.
★ PHILADELPHIA 6
337 No. Orianna St.
★ CHICAGO 7
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CLEVELAND 15
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WASHINGTON 4, D. C.
OFFICE
900 F St., N. W.

Get it
Faster-from Stock-
from MILNE
5
convenient warehouses

KOLORKOTE
TOOL STEELS
High Speed,
Alloy, and Carbon

HOLLOW, SOLID,
AND AUGER
DRILL STEELS
for all mining
and excavation work

BYERS GENUINE WROUGHT IRON BARS
To A.S.T.M. Specification A-189
To A.A.R. Specification M-302
To U. S. Navy
Specification 46-1-7C of May 1, 1944

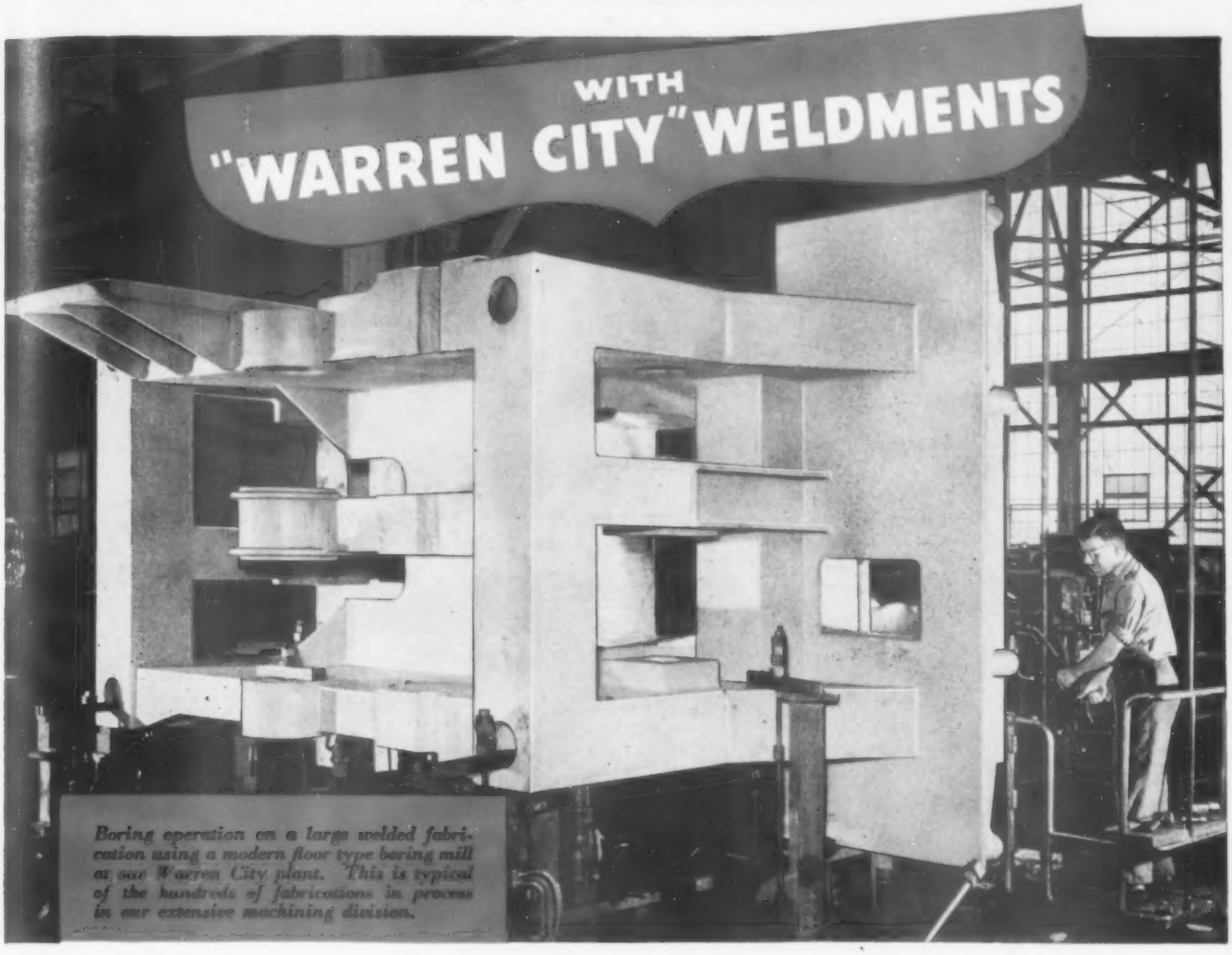
TIMKEN
GRAPHITIC STEELS
Machine Faster
Wear Longer

STRESSPROOF
T.M. Reg. U.S. Pat. Off.
STEEL
COLD DRAWN — FURNACE TREATED
"More than just strain-relieved."
"HIGHER IN-THE-BAR PHYSICALS"

NITRALLOY TYPE G 135 MODIFIED (AIRCRAFT) TO AMS 6470-A

also carried in Warehouse Stock.

SPEED UP RECONVERSION...



Boring operation on a large welded fabrication using a modern floor type boring mill at our Warren City plant. This is typical of the hundreds of fabrications in process in our extensive machining division.

USE WARREN CITY'S FAST, EFFICIENT SERVICE ON HEAVY-TONNAGE WELDMENTS AND ASSEMBLIES

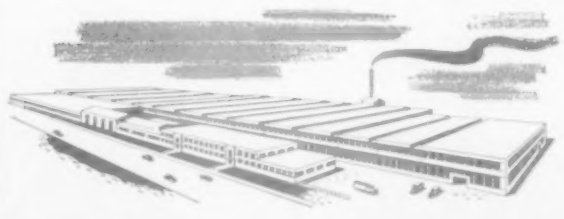
IF TIME is a critical factor in your reconversion plans, Warren City has the unusual production facilities and know-how to help you.

Our seven-million dollar plant is one of the most modern and complete shops in America for fabricating heavy machinery, parts and assemblies. Among its more than 600 pieces of large-capacity equipment are modern planers, shapers, milling machines, flame cutters, boring mills, grinders, lathes, automatic welders, cranes and stress relieving furnaces as well as extensive normalizing, X-ray and other testing apparatus.

Our ability to redesign heavy steel castings of many types into practical, modern weldments has effected vast savings in weight, bulk and cost, plus substantial gains in strength, production speed, freedom from flaws and ease of testing.

Indicative of our high standards of quality was the recent comment of an extensive user to the effect that Warren City weldments were the finest he had ever seen. Despite outstanding quality our prices are competitive.

Our cooperative engineering staff will gladly help with any problems from product development to quantity production without obligation to you. Call, wire or write us details of your problems.



WARREN CITY MANUFACTURING COMPANY ★★★

DEPARTMENT H

WARREN, OHIO

Wholly Owned Subsidiary of
GRAHAM-PAIGE MOTORS CORPORATION

IT'S NEW! IT'S BETTER! IT'S DIFFERENT!

BETHLEHEM Black Giant TOOL STEEL

(GRAPHITIC)

TYPICAL ANALYSIS

C	*Mn*	*Si*	*Cr*	*W*
1.40	0.90	2.20	0.45	0.50

TYPICAL USES

Machined dies; plug or ring gages; bushings; spindles; mandrels; seaming rolls; narrow strip or foil rolls; bending, drawing, cupping, and stamping dies; deep-drawing and forming operations; and other uses requiring high resistance to wear and abrasion.

Black Giant does not replace the standard oil-hardening tool steel (Bethlehem's BTR). It will, however, definitely complement the use of BTR in such special applications as those listed above.

Here's news of smashing interest to users of tool steels. News that can be headlined in three words: Bethlehem Black Giant.

Many months of chemical, metallurgical, experimental, and testing work preceded the announcement of Black Giant Tool Steel; but now the facts are established. Facts like these:

- Black Giant has superlative machining qualities.
- An oil-hardening tool steel, it responds readily to heat-treatment.
- It has much greater depth of hardness than ordinary graphitic steels.
- It has better non-deforming properties.
- Its self-lubricating qualities mean lower coefficient of friction; longer life in tools requiring high resistance to abrasive wear.

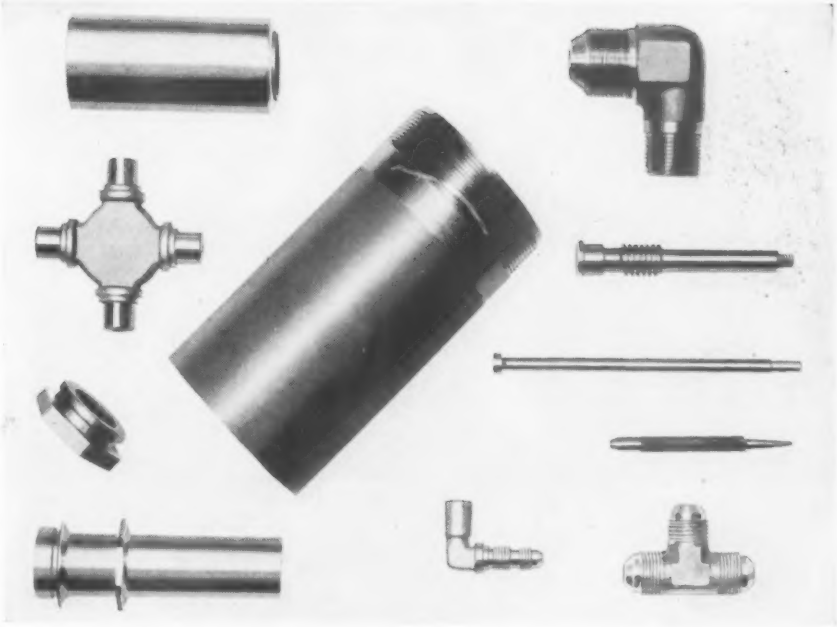
These are but a few of Black Giant's many advantages. There are others that you will want to hear about. For further details, check with the nearest Bethlehem office or distributor. *Black Giant warrants an immediate investigation.*

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY
Bethlehem, Pa.

VERS-O-TOOL

does all these jobs *fast and cheap*

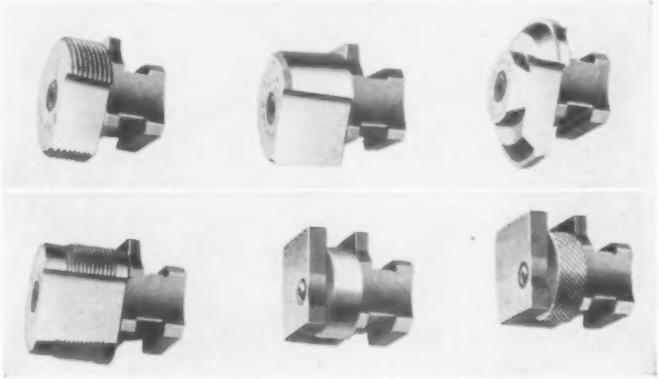


Threading, end turning and forming, knurling, burnishing, combination threading and end forming—these are the kinds of operations you can do with the Vers-o-tool.

Vers-o-tools are heads, either revolving or stationary, self-opening or hand-operated, that hold circular thread chasers or circular cutters to their work.

Their quick adaptability to different jobs brings you big savings in tool investment. And circular cutters and chasers may be replaced in one minute, without disturbing the setup—without "cutting and trying"—a saving in time and material. Still another saving comes in tool life—circular chasers and cutters may be reground through 270° circumference—they last 10 to 50 times longer. *Bulletin D-42-C.*

These are typical Vers-o-tools:
Style DR —capacities .056" to 5"
Style DS —capacities 3/16" to 5"
Style DBS—capacities .056" to 9/16"

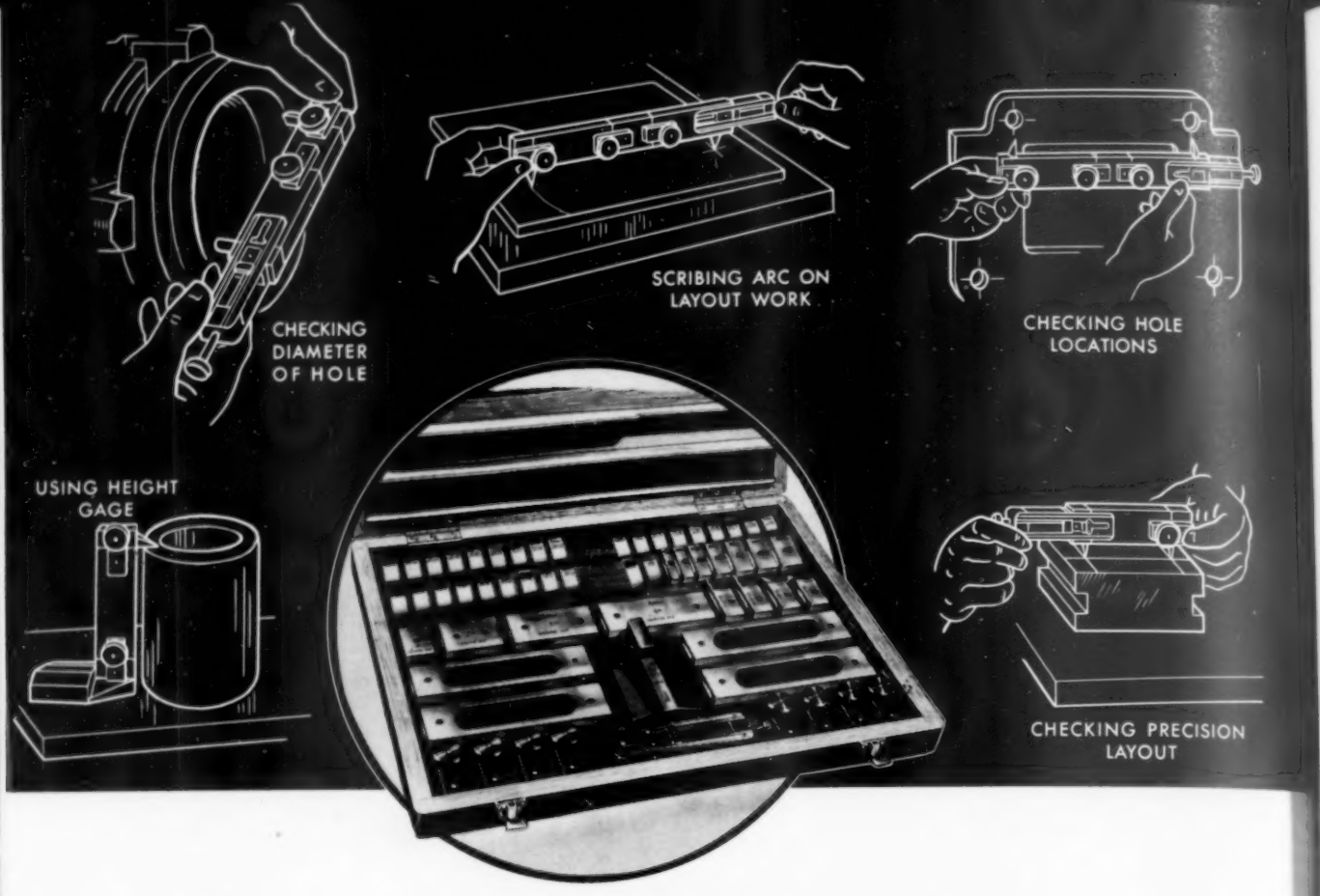


Types of circular ground thread chasers and circular cutters that may be used with any Vers-o-tool.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley 4-6 and 8 Spindle Bar and Chucking Automatics • Single Spindle Automatics • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing



So many uses... So easy to use
WEBBER *Heavy Duty* GAGE SET

● In this set Webber has made it possible to apply the precision of standard gage blocks to the accurate measurement of production work.

The Webber Heavy Duty set also brings to the shop a more useful tool for the layout and inspection of all precision shop work.

Shown are typical applications where accuracy in millionths of an inch are made possible easily and quickly with this Webber Heavy Duty set.

Note that there are no loose pins—nuts—or screws to complicate assembly of blocks into height gage or other precision measuring devices.

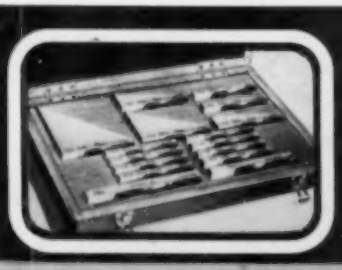
In assembling blocks into a precision device a group of standard blocks are held firmly in position by means of the Webber Eccentric Clamps (Patent applied for) and for assembling gage blocks under 1.000" the Webber Quick Acting Clamp is used.

You can assemble a precision instrument with this Heavy Duty Set in a fraction of the time it can be done with the average set.

Webber Heavy Duty Gage sets are furnished in two sizes No. 24—H. D.—range from .300" to 24" in steps of .0001". No. 36—H. D.—range from .300" to 36" in steps of .0001". All Webber Heavy Duty Gage Blocks are made in one grade—accuracy—.000005" per inch of length or fraction thereof. Additional Heavy Duty Blocks and Clamps available when required.

Price No. 24—H. D. Set $385.00
Price No. 36—H. D. Set 450.00

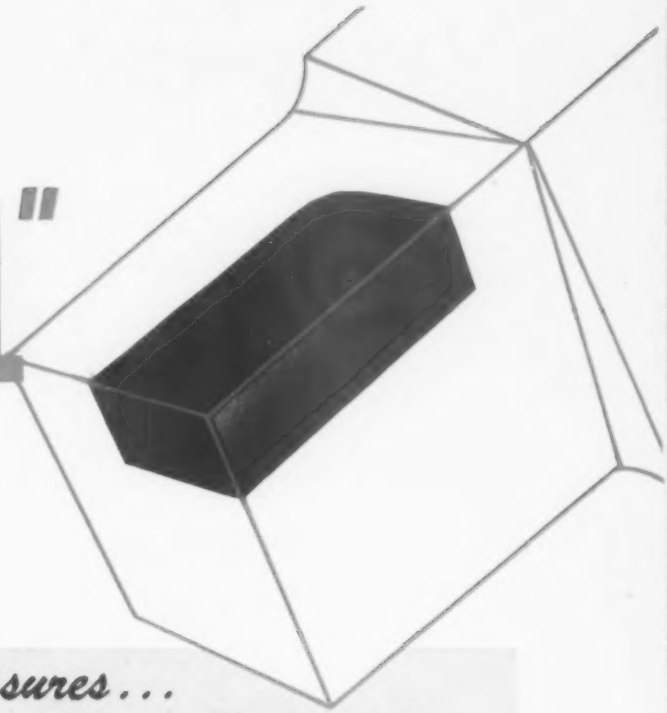
Bulletin upon request.



Webber GAGE COMPANY

12908 TRISKETT RD. • CLEVELAND 11, OHIO

A Long "PIECE-FULL" Life!



TECO
CEMENTED CARBIDE

assures . . .

1. **More Pieces Between Grinds**
2. **More Grinds Per Tool**
3. **Less Down Time**
4. **Lower Tool Cost**

The real test of Cemented Carbide is: "How many pieces will it produce during its lifetime?" TECO produces a higher total than other carbides because it has greater resistance to wear and breakage . . . *thus remains highly productive for the full life of the tool!*

By combining the correct qualities of hardness, toughness and uniformity, TECO metallurgists produce a carbide that holds a keen cutting edge longer and resists cracking or chipping in high-speed machining.

MAKE THIS TEST! Tool up several machines with TECO Cemented Carbide in place of present carbide tools and see for yourself that you get more production out of each TECO tool. Discuss your needs with one of our tool engineers. Send for catalog and price list.

TUNGSTEN ELECTRIC CORPORATION
570 39th STREET, UNION CITY, N. J.

TECO
CEMENTED CARBIDE
Pioneers in Tungsten Carbides for over a Quarter Century

Branch Office: 2906 Euclid Avenue, Cleveland, Ohio
Representatives: Indianapolis, Ind., Chicago, Ill., Detroit, Mich.

Here is a hard-to-make part for a fuel injection pump. Making it in *any* quantity calls for a complete understanding of the problem, and full appreciation of the close tolerances required — to say nothing of a very real ability to use modern skills, methods, machines and tools.

That Nichols has been able to produce this part in volume (at prices far below competition) proves that Nichols not only possesses the facilities *but also knows how to integrate them to your advantage.*

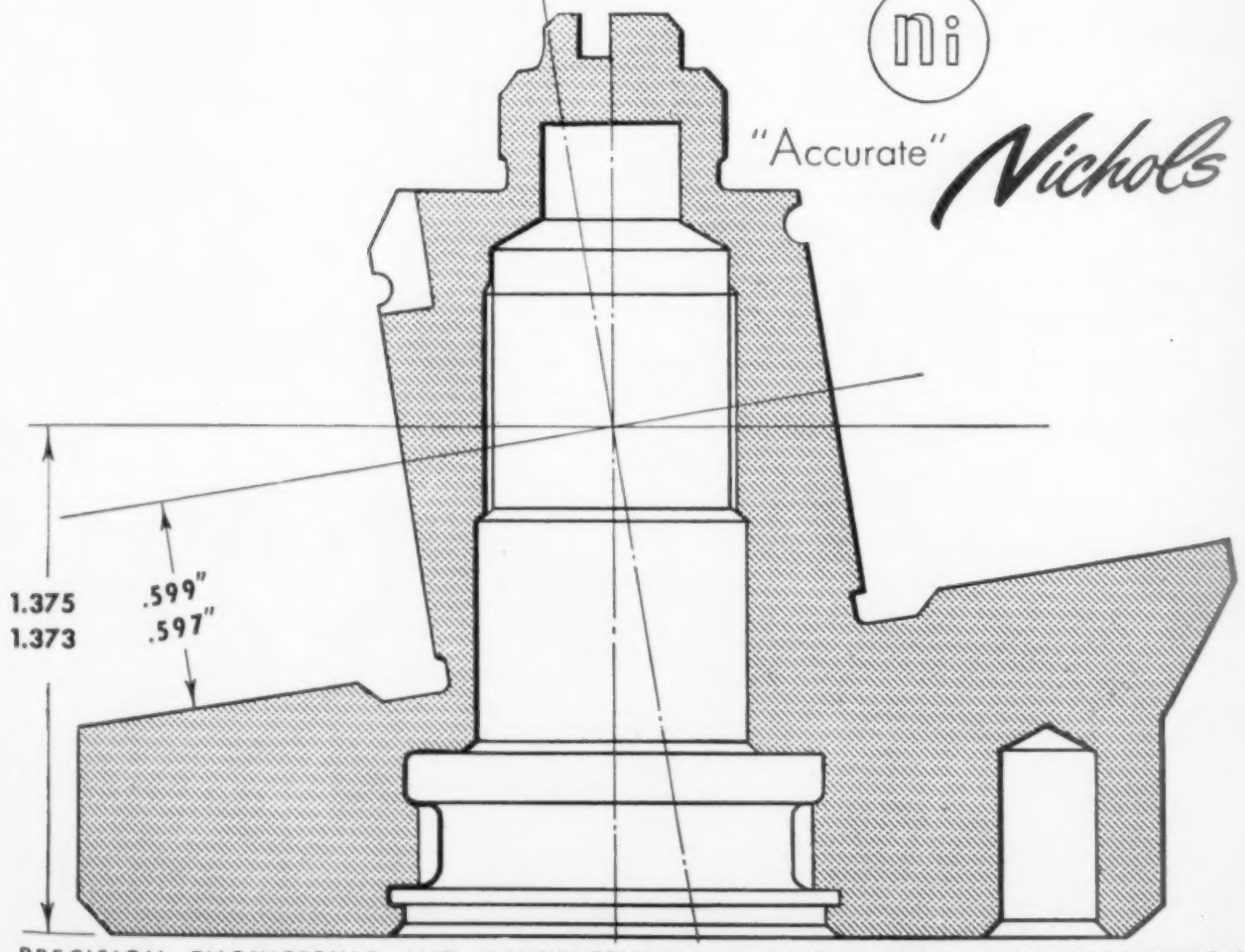
Because the *cost* of difficult, extremely accurate parts or assemblies is always important, Nichols "Mass Precision" methods should interest *you.* Send for a copy of our "Mass Precision" booklet. It shows some of the jobs we have done for others . . . suggests what we can do for you.

W. H. NICHOLS & SONS, 48 Woerd Avenue, Waltham, Mass.

Another Slant ON MASS PRECISION BY

ni

"Accurate" *Nichols*



PRECISION ENGINEERING AND MANUFACTURING FACILITIES FOR MASS PRODUCTION

Tool Steels

FOR EVERY INDUSTRIAL REQUIREMI

- **HIGH SPEED STEELS**
- **DIE STEELS FOR COLD WORK**
- **DIE STEELS FOR HOT WORK**
- **CARBON & CARBON-VANADIUM STEELS**
- **TOOL STEELS FOR SPECIAL PURPOSES**
- **CHROME VANADIUM TYPE STEELS**

The classification of Vasco Tool Steels simplifies choosing the *right* steel for the right job. Ask for our new booklet "Tool Steel Selection."

SEE OUR DISPLAY—BOOTH A-401—NATIONAL METAL CONGRESS
Cleveland, February 4-8, 1946

Vanadium-Alloys

STEEL COMPANY

COLONIAL STEEL DIVISION
ANCHOR DRAWN STEEL CO.

HERE'S HOW TO ORDER COATED ABRASIVES THE EASY WAY!

NOW you can be sure you get what you ask for when you order Coated Abrasives. A new system of naming and labeling takes out all the grief. From now on Coated Abrasives by "CARBORUNDUM" are identified by the name of their end use. Specifications are clearly marked on labels and backing material. Here's how it works. To get the right coated abrasive for your job:

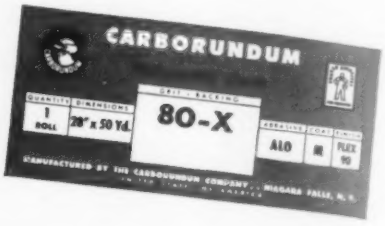
1—GET THIS BOOK

This new free book describes the new system of identifying, specifying and ordering Coated Abrasives by "CARBORUNDUM". It also gives complete information about their uses.

2—LOOK AT THE BACKING

The man in the shop can tell what coated abrasive to requisition from stock just by a glance at the backing. Name and specifications are repeated often enough so that even small pieces are easily identified.

3—LOOK AT THE LABEL

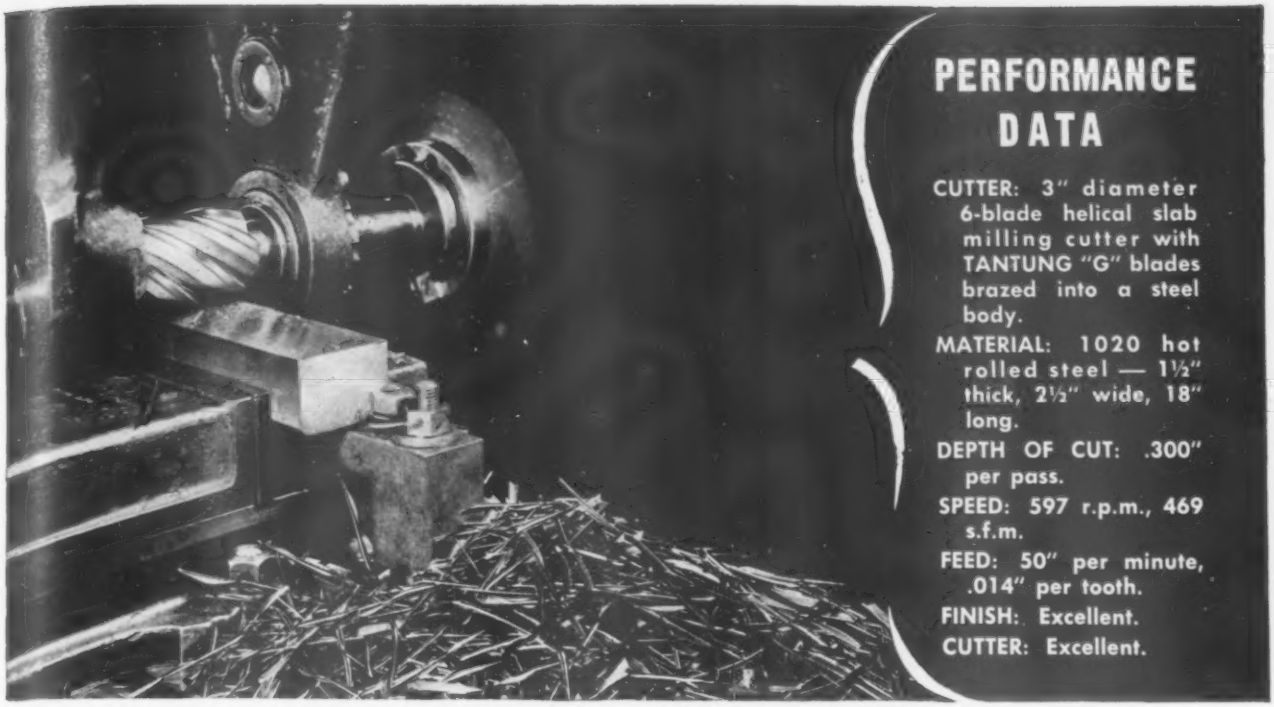


The same information is repeated on the package label, so it's easy for the stock room to fill the requisition. And it's just as easy for Purchasing to make out repeat orders.

The first thing to do is write for your free copy of "Sanding and Finishing" if you have not yet received your copy. For additional information, consult your "CARBORUNDUM" representative or your distributor's salesman. The Carborundum Company, Niagara Falls, N.Y.

THERE IS A PRODUCT BY
CARBORUNDUM
TRADE MARK
FOR EVERY ABRASIVE APPLICATION

("CARBORUNDUM" is a registered trade mark of and indicates manufacture by The Carborundum Company)



PERFORMANCE DATA

CUTTER: 3" diameter 6-blade helical slab milling cutter with TANTUNG "G" blades brazed into a steel body.

MATERIAL: 1020 hot rolled steel — 1½" thick, 2½" wide, 18" long.

DEPTH OF CUT: .300" per pass.

SPEED: 597 r.p.m., 469 s.f.m.

FEED: 50" per minute, .014" per tooth.

FINISH: Excellent.

CUTTER: Excellent.

636 POUNDS OF CHIPS AN HOUR WITH TANTUNG

TOOL MANUFACTURERS...

- More and more tool manufacturers are using TANTUNG to improve their products.
- This helical slab mill with six TANTUNG blades, brazed to an ordinary steel body, is removing metal at a rate of speed 300 to 400 per cent greater than has ever been possible with steel cutters.
- TANTUNG, a strong, tough, abrasion and corrosion-resisting alloy will give similar performance in your product. Write us today. Our experience and complete engineering facilities are at your service

TANTUNG Bits, Single Point Tools, Cut-Off Blades and Shell End Mills are distributed by VASCOLOY-RAMET CORPORATION, North Chicago, Illinois, a Fansteel Affiliate

TOOL USERS...

The TANTUNG slab mill shown in this picture will be available through leading milling cutter manufacturers, whose names will be furnished upon request.

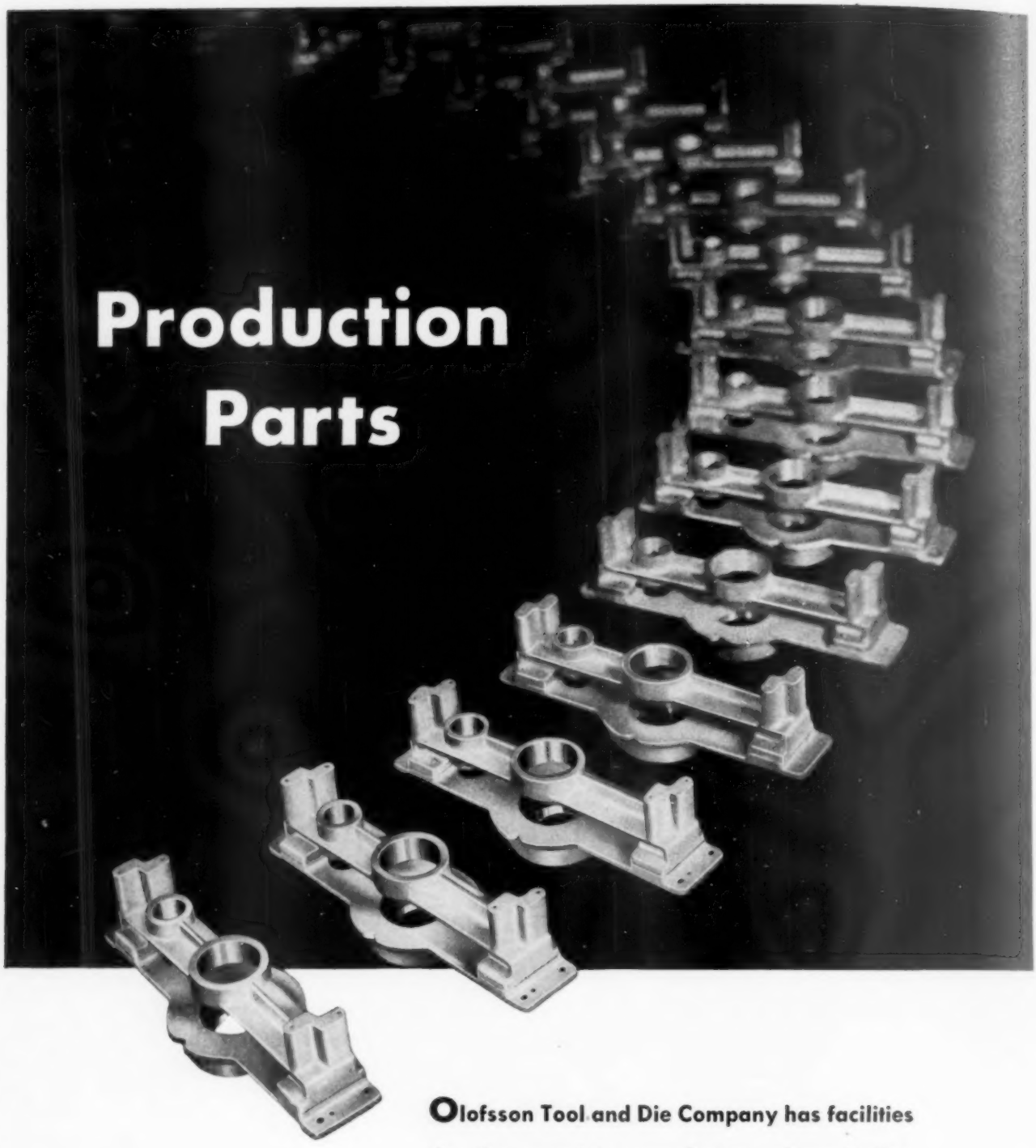
TANTUNG Rotary Files, Drills, Gages, End Mills and Milling Cutter Blades are obtainable from leading tool manufacturers.

FANSTEEL METALLURGICAL CORPORATION

NORTH CHICAGO, ILLINOIS • DISTRICT OFFICES IN PRINCIPAL CITIES

4536

Production Parts



Olofsson Tool and Die Company has facilities for the complete manufacture of production parts in quantity. A separate plant has been organized to maintain this production on a quality basis equal to Olofsson's usual high standards. This plant is equipped with latest types of turret lathes, vertical and horizontal mills, single and multiple drill presses, diamond boring and finishing machines. We are prepared to service that unusual production problem of yours.

Olofsson

TOOL AND DIE COMPANY
LANSING 2, MICHIGAN

CHICAGO ENGINEERING OFFICE—600 SOUTH MICHIGAN AVENUE

Frame production at The Murray Corporation of America, with "Hy-Power" hydraulic riveters.

"Hy-Power" riveting speeds frame production . . .

Modern automotive frames, with their large number of rivets, can be economically produced principally because of the development of modern progressive assembly and the speed and ease of handling of Hannifin "Hy-Power" hydraulic riveter equipment. The cold rivet squeezing action is a completely automatic cycle controlled at the touch of a push button. Hannifin riveter yokes can be provided in a wide range of standard types, shaped to provide easy handling and access to any rivet location. The leading producers, all around the world, have used Hannifin "Hy-Power" hydraulic riveters for ten years.

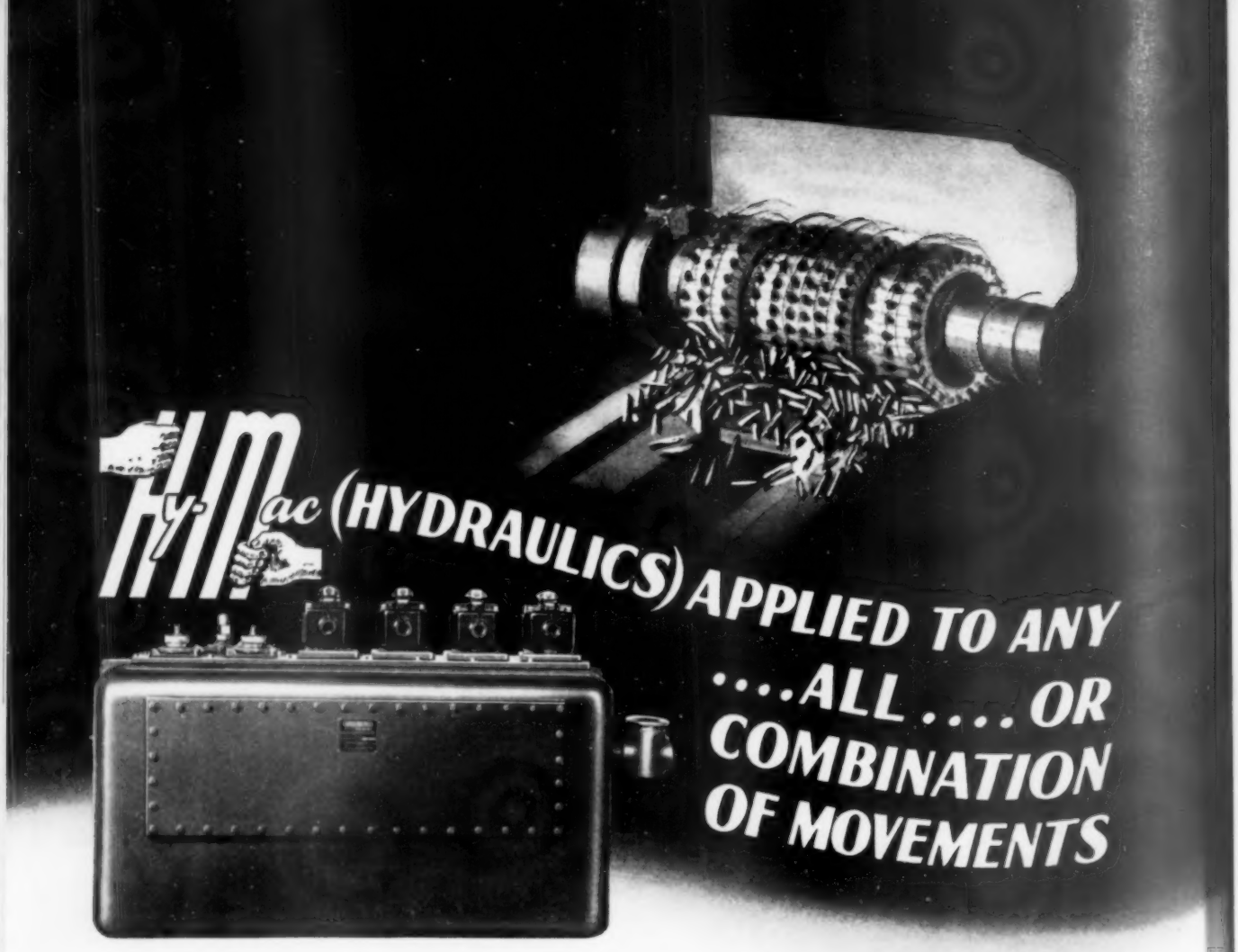
Hannifin "Hy-Power" equipment meets today's needs for fast production, uniform quality of work, and continuous performance. Write for "Hy-Power" bulletin, or consult Hannifin engineers for specific recommendations.

Hannifin Manufacturing Company, 621-631 South Kolmar Avenue, Chicago 24, Illinois.

HANNIFIN · CHICAGO · USA

Hannifin

"Hy-Power" RIVETERS



12777 (above)—Special power unit for controlling and actuating a special contour type milling machine with multiple slides. This design permits the assembly of the completed unit on the base of the machine and provides easy accessibility for adjustment and maintenance. The control is electric through push-button and limit switches, reducing the piping to a minimum, the only pipes being used, other than those incorporated in the unit itself, are those connecting the unit to the actuating cylinders.

"Hy-Mac" Hydraulic Power Units can be applied to milling, drilling, grinding, boring, piercing, riveting, broaching, pressing . . . just determine the functions of the machines that are to be hydraulically operated—and our engineers will recommend a Power Unit and a layout of circuits to best do the job . . . For feed and traverse of multiple or single tools . . . for indexing and locating . . . for clamping, etc. . . . any . . . all . . . or combination of movements can be adapted to "Hy-Mac" HYDRAULICS . . Designers or builders of machines can accommodate their specific design, either partially or completely to "HY-MAC" HYDRAULICS . . . and our modern plant, together with a comprehensive engineering department is completely competent to handle all of the technical planning, designing, and detailing in connection with building of hydraulic and specific-purpose machinery . . . Our engineers will make recommendation and preliminary proposal without obligation.

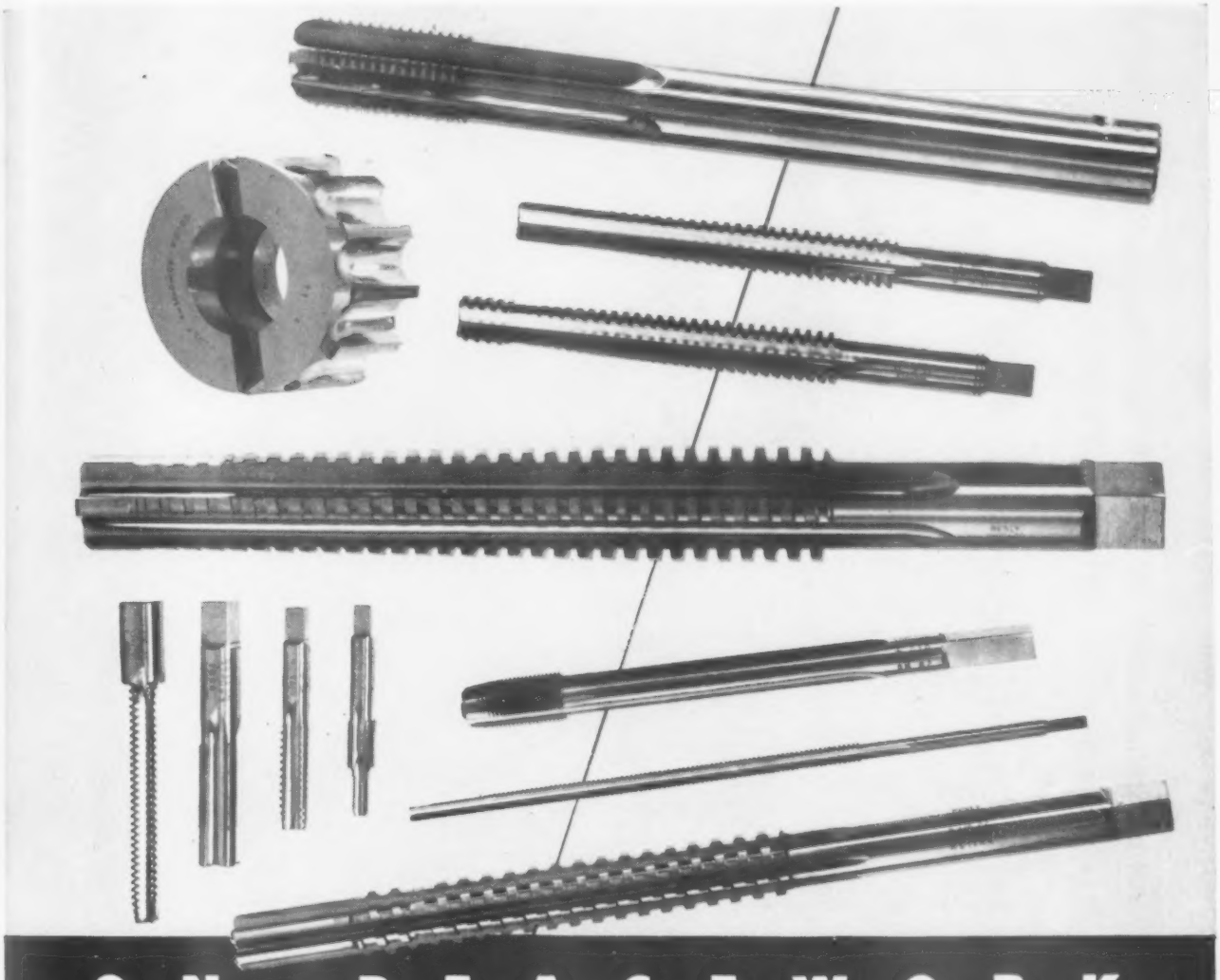
Hy-Mac

HYDRAULIC MACHINERY INC.

12825 FORD ROAD DEARBORN, MICHIGAN

HYDRAULIC MACHINERY—WESTERN DIVISION—1105 N. Pacific Avenue, Glendale 2, California

HYDRAULIC MACHINERY



ON PEACEWORK

Helpful Facts FOR TAP USERS

●This valuable booklet contains vital information on taps and tapping procedures. Tables list various classes of fits. Tap drill sizes and tapped hole sizes are shown in detail. It also contains interesting charts, diagrams and information of tap grinding and sharpening. *Write today on your own letterhead for your copy—free.*

Specify BESLY TAPS

for Smooth, Accurate Threads

Their fine war record proves the capacity of Besly Taps to meet the stiffest specifications for clean-cut, close-tolerance threading . . . No wonder they continue in high demand for the production of peacetime products.

Whatever your requirements—in stock designs or "specials"—there's a Besly Tap that will fill your needs to perfection. In taps, "Besly" means finest steel, skilled workmanship and 50 years experience in making precision taps.

Besly engineers can be of greatest help to you when your selection of taps is still in the "problem" stage. Why not invite their help TODAY? NO obligation, of course.

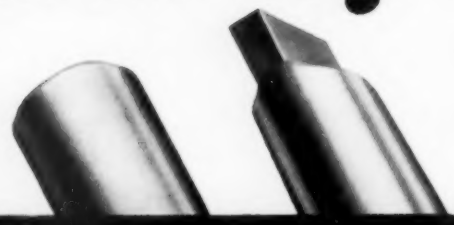
BESLY

BESLY TAPS • BESLY TITAN ABRASIVE WHEELS
BESLY GRINDERS AND ACCESSORIES

CHARLES H. BESLY AND COMPANY • 118-124 N. Clinton St., Chicago 6, Ill. • Factory: Beloit, Wis.

THINK OF IT!

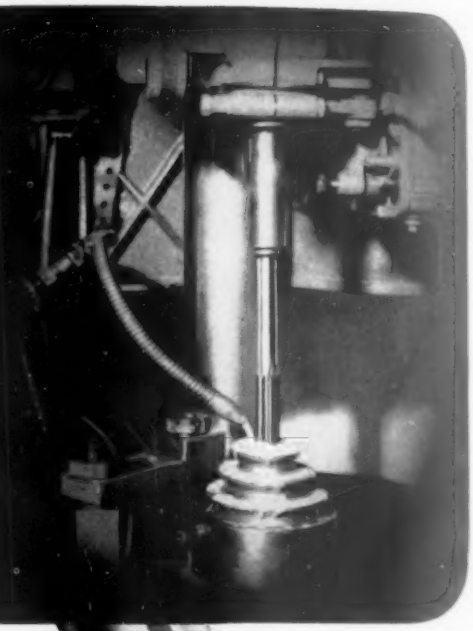
8,000 holes per grind with NEW IMPROVED WENDT-SONIS REAMER



All Standard Sizes Available With Straight or Tapered Shanks

PRODUCTION DATA REPORT

Name: Delta Manufacturing Company
Address: Milwaukee, Wisconsin
Tool: Wendt-Sonis Carbide Reamer. Carbide full length of flute.
Job: Reaming Pulley Wheel Hole. S.A.E. 6150 steel. Super finish required.
Speed: 935 RPM.
Feed: .006" feed per revolution.
Results: Averaged 8000 holes per grind—holds size—super finish.



First again

WENDT-SONIS REAMERS with FULL LENGTH CARBIDE FLUTES

Here is a reamer that will reduce rejects, speed up production and save on tool costs.

Wendt-Sonis *full length carbide flutes* eliminate "wobbling" ordinarily caused by wear on steel flutes. These new *full length carbide flutes* have greater wear resistance than those with carbide tips only. They prevent chips from marring the hole on horizontal reaming jobs. Maximum flute bearing surface in bushing assures perfect hole alignment and long life. These reamers can be used on angle reaming jobs without guide bushings. Now AVAILABLE in all standard sizes. WENDT-SONIS COMPANY, HANNIBAL, MISSOURI. BRANCH WAREHOUSE: LONG BEACH, CALIFORNIA.

WENDT W S CARBIDE SONIS

CARBIDE TIPPED CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS
FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • SPECIAL BITS

NEW INFORMATION ON INSPECTION COST-CUTTING

This 24-page booklet contains new information on Sheffield Visual Gages (5 magnifications). The uses of many accessories which have proved so valuable in economical, rapid and accurate dimensional control, are illustrated and described. New applications are shown. • This booklet is of equal interest to prospective as well as to present Visual Gage users who will find new ways of putting Visual Gages to work on peacetime production.

YOUR COPY GLADLY SENT IF REQUESTED
ON YOUR COMPANY LETTERHEAD

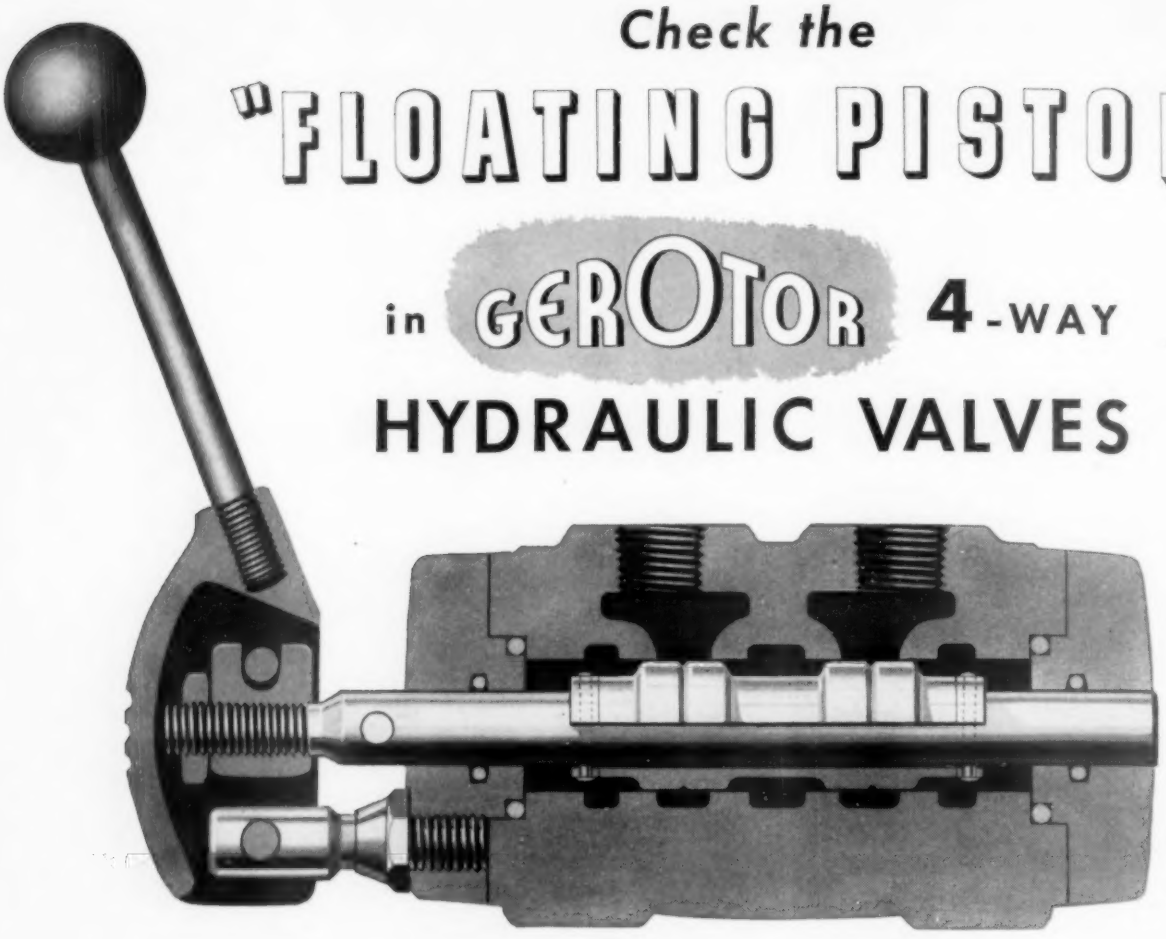
THE SHEFFIELD CORPORATION

Dayton 1, Ohio, U.S.A.

SHEFFIELD MASTER CRAFTSMEN

MACHINE TOOLS • GAGES • MEASURING INSTRUMENTS • CONTRACT SERVICES

Check the "FLOATING PISTON" in GEROTOR 4-WAY HYDRAULIC VALVES



- "FLOATING PISTON" design provides tight sealing ability with extreme ease of operation. This construction gives the piston a close precision fit in the valve bore and still allows it to move freely and easily, because such movement is independent of the valve stem in the valve covers.

Other features are:

- "O" ring seal design prevents oil from leaking past piston stem and reduces friction.
- "O" ring seal on valve covers assures positive sealing with no gasket.
- Large oil passages allow full capacity flow.

Send for Catalog showing complete line of Gerotor Hydraulic Valves, Cylinders, Pumps and Pump Units.

GEROTOR MAY CORP., LOGANSPORT, IND.

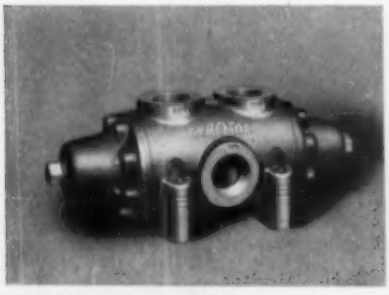
PLANTS AT BALTIMORE, MD., LOGANSPORT, IND.

4 TYPES OF ACTION
Standard, Spring Return, Spring Centered, Ball Detent.

5 PISTON DESIGNS
To meet the requirements of any hydraulic circuit.

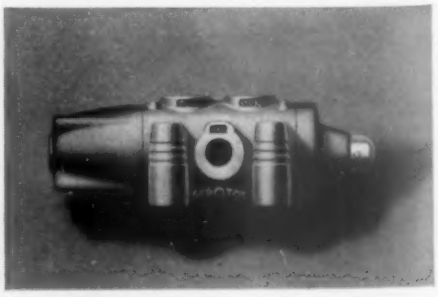
6 TYPES OF OPERATION
Hand, Foot, Cam, Solenoid, Oil operated, Air operated.

7 SIZES
¼", ⅜", ½", ¾", 1", 1¼", and 1½".



AIR PRESSURE OPERATED:
Gerotor 4-Way Hydraulic Valve.

OIL PRESSURE OPERATED:
Gerotor 4-Way Hydraulic Valve.

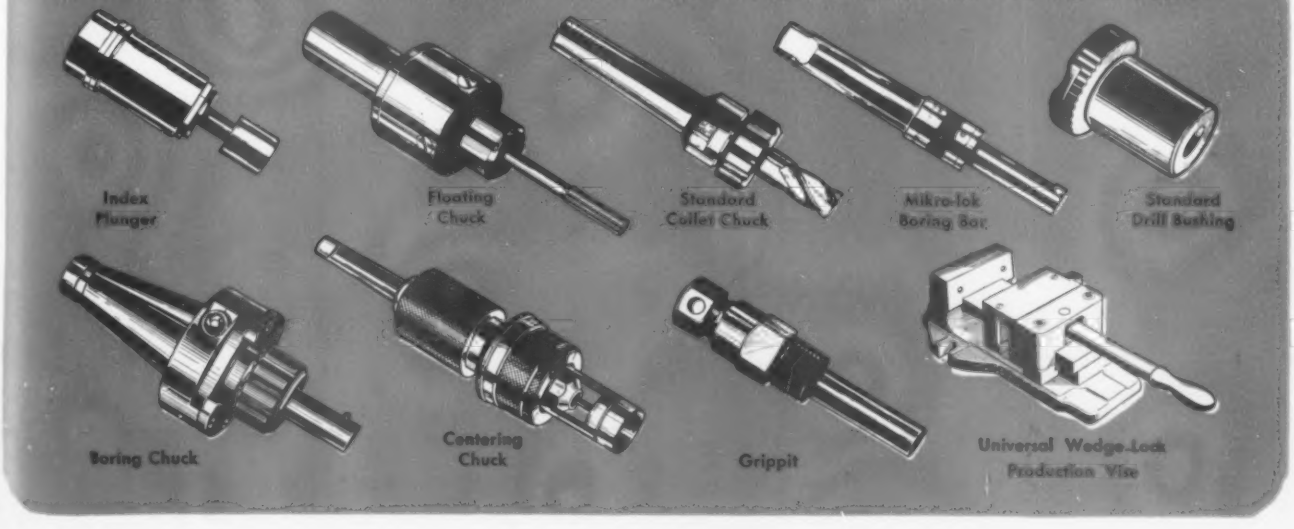


CAM OPERATED:
Gerotor 4-Way Hydraulic Valve.

UNIVERSAL CENTERING CHUCKS
AND ADJUSTABLE STOP CHUCKS

Universal Centering Chucks make a centering machine of practically any medium size drill press. Furnished with collets and bushings to hold and guide a wide variety of center drills. Bushings are beveled to form conical surface that fits firmly over ends of shafts to be centered. Depth of drill penetration easily regulated within few thousandths. **Universal Adjustable Stop Chucks** control the depth of holes and countersinks on hand feed machines. Revolving stop arrangement operates on ball bearings, eliminating excessive wear to stop portion and preventing damage to machined surfaces when work itself is used as stop. Collet firmly grips either flute or shank of jobber's or straight shank drill. Write for complete information.

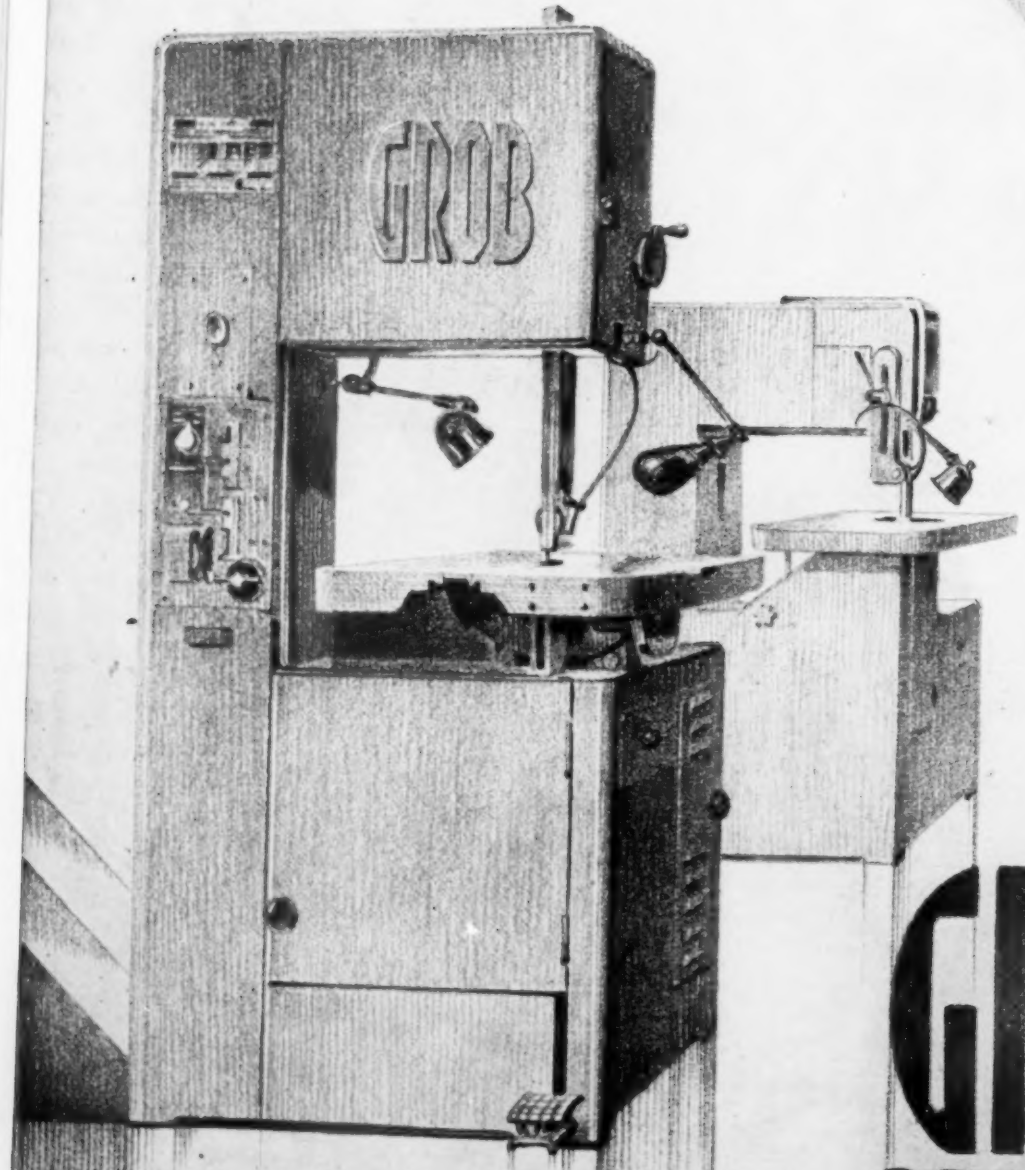
UNIVERSAL TOOLS THAT WILL INCREASE PRODUCTION AND ACCURACY IN YOUR PLANT



UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH, MICHIGAN — Fighter Plane Given by Employees — 20% Employee Bond Deductions

SAWING FILING

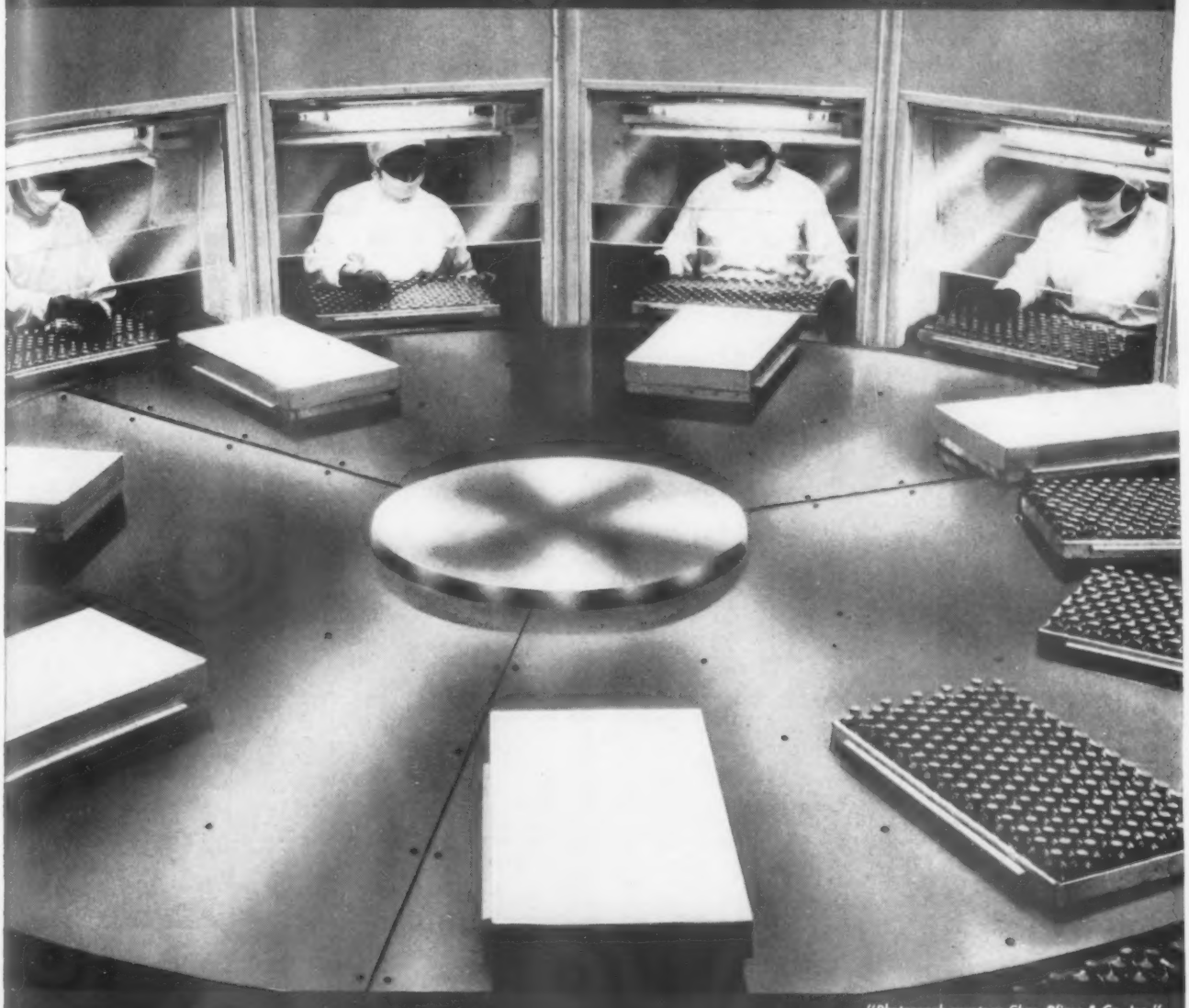


GROB BROTHERS

GRAFTON WISCONSIN

STAINLESS STEELS

Most versatile of modern metals... their unique combinations of properties merit your consideration in designing for the future.



"Photograph courtesy Chas. Pfizer & Co., Inc."

Packaging the miracle drug... penicillin... calls for completely sterile conditions. Here the table must be the very acme of aseptic cleanliness... easy to clean and keep clean. Hence, it's chromium-Nickel stainless steel.

• • •

International Nickel are miners, smelters and refiners of Nickel, an important ingredient of the stainless steels, but do not produce stainless steels. If interested, please communicate with your established sources of supply for stainless steels.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street New York 5, N.Y.

TOOL STEEL DATA

Revised Data for Water Hardening Tool Steels including types, analyses, uses, hardening characteristics and temperature ranges

WATER HARDENING TOOL STEEL CHARACTERISTICS

TYPE	GRADE	ANALYSIS	USES Water Hardening Tool Steel for Cold Work Dies and Tools Requiring:	HARDENING CHARACTERISTICS		
				HARDENING TEMPERATURES	QUENCH	RC
Carbon Alloy Treated	SPECIAL	C * Mn .25 Si .25 Cr .15 V .04	• Highest Quality • Keen Cutting • High Surface Hardness with a Tough Core	Range: 1420° F. to 1530° F. Cutting and Shearing Tools: 1420° F. to 1450° F. Parts Subject to Steady Pressure: 1440° F. to 1480° F. Dies Subject to Severe Blows: 1470° F. to 1530° F.	Water or Brine	64-66
Carbon	EXTRA	C * Mn .25 Si .20	• High Hardness of Medium Depth • Good Wear Resistance • Shock Resistance	Range: 1425° F. to 1550° F. Cutting and Shearing Tools: 1425° F. to 1450° F. Forming; Steady Pressure Tools: 1440° F. to 1490° F. Dies Subject to Heavy Blows: 1500° F. to 1550° F.	Water or Brine	64-66
Carbon Vanadium	VANADIUM EXTRA	C .95 Mn .30 Si .25 V .20	• Increased Wear Resistance • Added Toughness and Fatigue Resistance	Range: 1450° F. to 1500° F.	Water or Brine	64-66
Carbon Chrome	WATERDIE	C 1.00 Mn .35 Si .25 Cr. .55	• Uniform Strong Case in Large Sections • High Wear Resistance	Range: 1500° F. to 1525° F.	Water or Brine	64-66
Carbon Manganese	EXTRA HEADER DIE	C .95 Mn .35 Si .25	• Uniform Deep Hardening in tools such as Header Dies	Range: 1475° F. to 1550° F.	Water or Brine	64-66

QUENCHING: A brine quench 60° to 80° F. is recommended. Remove tools from the quench at approximately 300° F. and cool in air to about 125° F. and temper immediately.

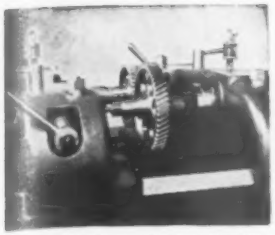
TEMPERING: These are usually tempered from 300° F. to 600° F. As the temperature increases, hardness decreases and toughness increases.

NOTE: These steels meet rigid Hot Etch and Hardenability Standards. Water hardening steels harden with a depth of case of 1/8" to 1/4" depending on Mass, Hardening Temperature and Hardenability.
*Available in 3 carbon ranges: approx. C 1.15; approx. C 1.05; and approx. C .95.

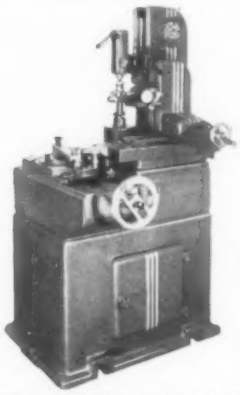
COLUMBIA TOOL STEEL COMPANY

MAIN OFFICE AND WORKS—CHICAGO HEIGHTS, ILLINOIS

Branches and Warehouses . . . CHICAGO • CINCINNATI • CLEVELAND • DETROIT • MILWAUKEE



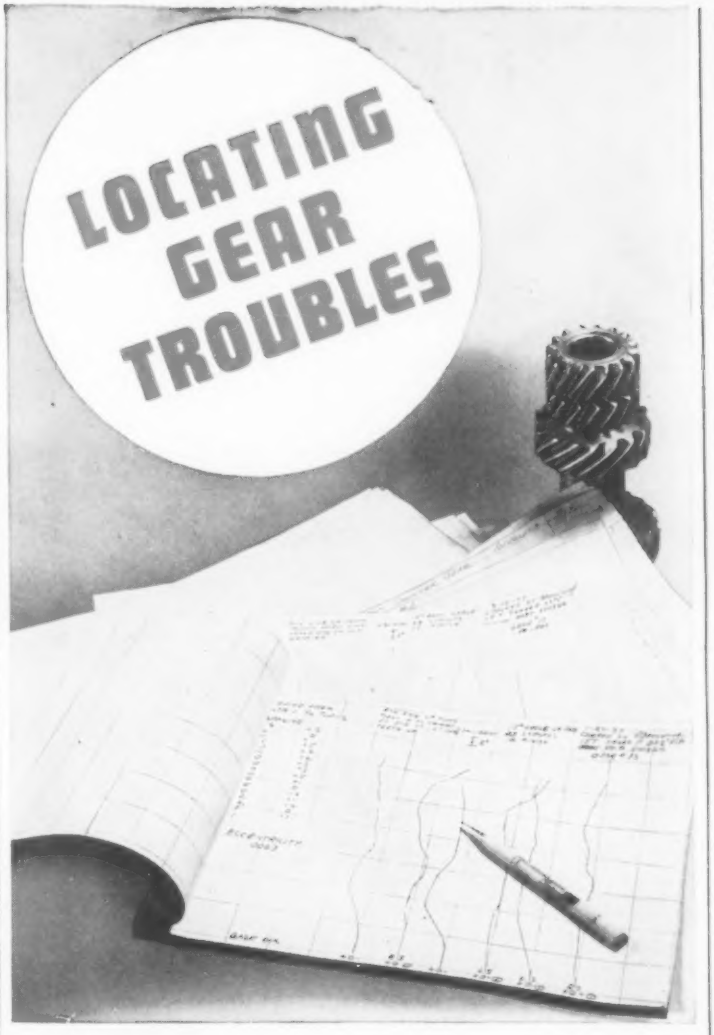
MICHIGAN GEAR SPEEDERS are available in two types for quick checking for quietness and bearing. Ask for information on Model 1127-B (for gears up to 9½") or 1129 (for gears up to 13").



MICHIGAN SINE-LINE INVOLUTE CHECKER provides rapid check of gears without necessity of additional base rolls, etc. Ask for information on Model 1124 (for gears up to 12" O. D.) or Model 1124-C (for gears up to 20").

MICHIGAN SINE-LINE LEAD CHECKERS will check left or right hand helical gear leads from zero to infinity without necessity of additional master rolls, discs or lead screws. Ask for information on Model 1205-18 (for gears up to 18") or 1205-24 (for gears up to 24").

MICHIGAN BASE PITCH AND SPACING CHECKER recently added to the Michigan SINE-LINE. Ask for information on Model #1130.



GOOD gears are not a matter of accident. They are the result of selecting the right kinds of steels, sticking to accurate production methods and equipment, proper heat-treating and adjusting for heat treat distortion.

To produce good gears *consistently*, good checking equipment is a "must". That is why Michigan SINE-LINE equipment includes machines to check and analyze not only gears but also gear cutting tools with laboratory precision *in the shop.*

Michigan Tool Company—Gear Production Headquarters—field engineers will be glad to help you on your gear problems and advise you as to the type of Michigan SINE-LINE equipment best suited to your specific needs.

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS RD. DETROIT 12, U.S.A.

SINE-LINE HOB CONTOUR CHECKERS permit quick checking of pressure angles of hobs on a simple fixture. Ask for information on Model #464.

MICHIGAN HOB-SHARPENING CHECKER incorporates complete facilities for checking correct resharpening of hobs, milling cutters and form cutters. Ask for information on Model #471.

MICHIGAN AUTOMATIC CHECKING RECORDER can be coupled to SINE-LINE involute, lead, or spacing checkers. Makes permanent chart records. Can be used for other purposes than gear checking, too. Ask for information on Model AY-1.

SINE-LINE LEAD AND LINE OF ACTION CHECKER for Hobs. Checks deviations from true lead to ten-thousandths of an inch. Line of action sine-bar also permits checking of active profile. Ask for data on Model #874.

Screw Machine CAMS

For.. **CECO • GIBBS • TORNOS**
GORTON • WICKMAN • POLYMATIC
PETERMAN • DAVENPORT
BROWN & SHARPE

★

IF YOU ARE INTERESTED IN CAM DESIGN FOR BROWN & SHARPE AUTOMATIC SCREW MACHINES CONTACT US AND GET YOUR NAME ON OUR MAILING LIST.

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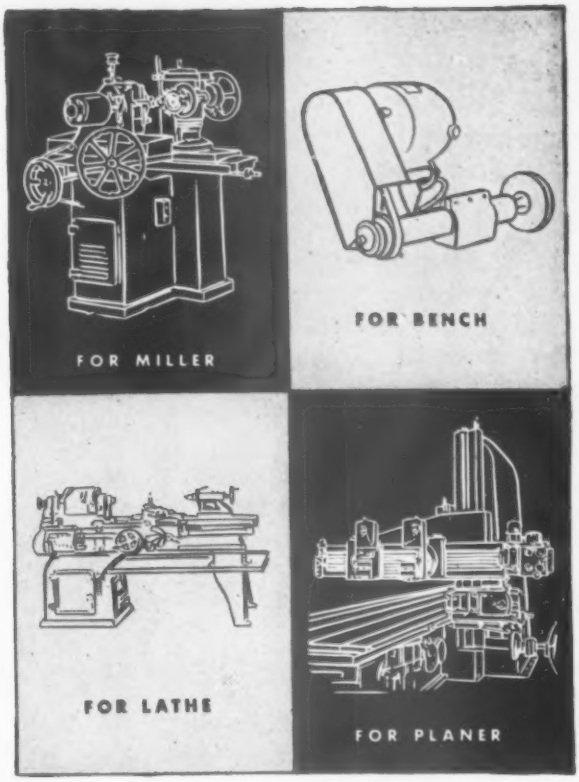
GEORGE L. DETTERBECK
Company

1871 CLYBOURN AVENUE
CHICAGO 14, ILL.



THIS PORTABLE PRECISION TOOL POST GRINDER COULD VERY WELL BE THE BUSIEST MACHINE IN THE PLANT...

. . . for it grinds efficiently on lathe, shaper, planer, miller, or bench. Exclusive Lempco base construction provides equivalent of two different length quills for price of one. Fitted portable storage chest available. Better order yours while ceiling price still prevails! Good delivery.

- ★ *FOR INTERNAL, EXTERNAL, FACE, AND TAPER JOBS.*
- ★ *PRELOADED MATCHED SETS OF BEARINGS.*
- ★ *RIGID 1-PIECE FRAME.*
- ★ *6,000 TO 13,000 R.P.M. SPINDLE SPEEDS.*

LEMPCO

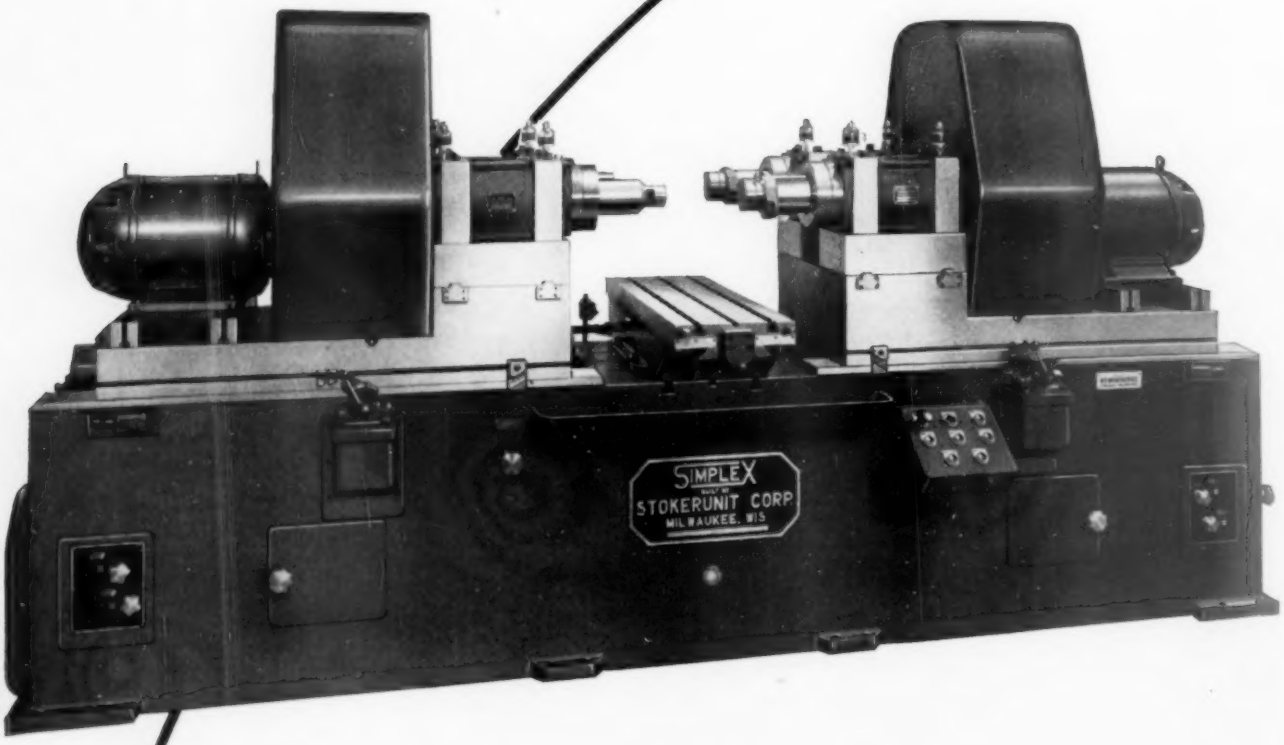
5496 DURHAM RD. • BEDFORD, OHIO

WRITE FOR CATALOG

PATENTS MAKE JOBS

SIMPLEX

Increasing wage rates of today make necessary new methods of reducing costs. At medium production rates, this becomes difficult with general purpose machine tools. Simple multiple tooling and fixtures, indexing from roughing to finishing position, offer a new cost reduction method. Tooling costs are low — job possibilities endless.



This photograph shows a SIMPLEX 4U 2-way Precision Boring Machine equipped with four #4 spindles and a hydraulically indexed sliding table operating between adjustable positive stops. On the sliding base a single work holding fixture is mounted providing for operating on the work from both ends. After the roughing operation is completed on both ends, the table is indexed to the finishing position, the finishing operations are performed on both ends simultaneously and the completed job is ready to remove from the fixture to change to the next job. The fixture and tools are removed and retained intact, ready for a quick set-up when the job is again run. The automatic cycle relieves the operator and helps maintain predetermined production schedules.

Precision Boring Machines

STOKERUNIT CORPORATION

SIMPLEX Machine Tools Division

4528 West Mitchell Street, Milwaukee 14, Wisconsin

Precision Boring Machines, Planer Type Milling Machines and Special Machine Tools

Keep that pencil sharp with FIRTHITE

Here's Why!

During the war it was a matter of *production speed* . . . and carbide cutting tools were the answer.

Today it's a matter also of keeping operating costs down. High production, yes . . . but at costs that meet or beat competition. Again Firthite sintered carbide tools will help you keep red ink out of your records, while turning out a better, more salable product.

if you have a tool or die problem

Call **Firth-Sterling**

STEEL COMPANY

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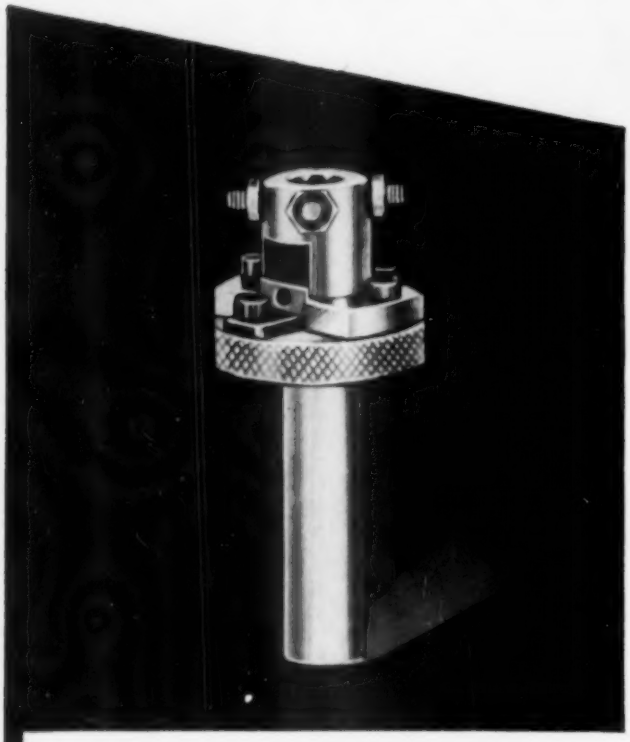


A New Precision Holder for Better Reaming

Here is a reamer holder designed and built by reamer specialists, with the one basic idea of bringing to your turret lathes, hand and automatic screw machines, the full precision qualities inherent in L & I Ground Flute Reamers.

The L & I Precision Centering Reamer Holder employs a new design principle. It quickly establishes a new center absolutely true with the spindle axis, and drives the reamer from this dead center. *Reamer does not float* — but follows true centerline free from weight or pressure. No bushings — no bell-mouthing — no tapered holes — corrects diagonal errors in turrets with worn locks.

Standard model holds reamers from 1/16″ to 7/16″ diameter interchangeably. Larger model for reamers 7/16″ to 1⅛″ diameter.

Write for bulletin giving full specifications and prices.

LAVALLEE & IDE, INC. • CHICOPEE, MASS.

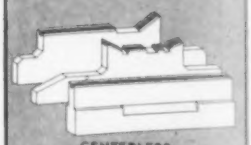
L&I GROUND FLUTE REAMERS

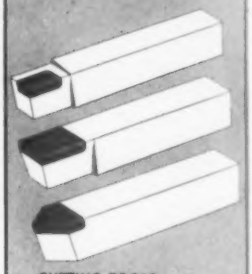
TALIDE-TIPPED for *Extra* Production!

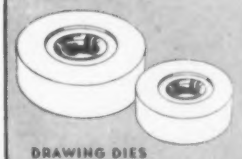
TALIDE METAL . . . is a superior grade of Tungsten Carbide—developed by us during the past fourteen years and manufactured today by our exclusive Hot Press Method. It has exceptional density, strength and hardness and is ideal for application at wear points on tools, machinery and equipment. Our special process makes it possible to produce Talide Metal wear strips in any length, die nibs and bushings with hole sizes up to 24", and tool tips with extra hardness and toughness.

War plants all over the country are using super-hard Talide Metal to increase the output of all types of ordnance material processed on lathes, grinders, draw benches, presses and other metal-working equipment.

When peace comes, the extra advantages that Talide Metal offers of LONGER LIFE, BETTER FINISH, CLOSER TOLERANCE and MORE CONTINUOUS MACHINE OPERATION will make it possible to produce greater quantities of lower cost peace-time goods. Our experienced organization will gladly recommend where Talide Metal can profitably increase your production. Your inquiry will receive our prompt attention.


CENTERLESS BLADES


CUTTING TOOLS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DIAMOND DRESSERS

TIPPED WITH TALIDE TUNGSTEN CARBIDE

METAL CARBIDES CORPORATION

YOUNGSTOWN 5, OHIO

TUNGSTEN CARBIDE TOOLS · DIES · WEAR PARTS

SELF OPENING DIE HEADS

STYLE MM For use on multiple spindle automatics such as Gridley, Acme, Cleveland multiple, New Britain, Cone, Greenlee, Davenport, etc. or any machine on which the die head rotates, i.e., chucking machines, bolt threaders and drill presses, etc.

STYLE DMS Designed for threading on turret lathes, hand screw machines and other similar machines on which the die head does not rotate.

STYLE DM Designed especially for use on Brown & Sharpe automatics and Cleveland single spindles. Function efficiently and dependably at very high indexing speeds.

STYLE TM Developed for the purpose of cutting superior quality taper pipe threads. It is designed to cause the chasers to recede at a definite rate. When the proper length of thread is cut the die head instantly opens, withdrawing the chasers from the work. No marks are left along the thread to show where chasers stop cutting.

SOLID ADJUSTABLE DIE HEADS

Use same Insert Chasers as the opening die heads. These heads are light in weight, small in diameter, no moving parts but adjustable for size. Chasers extend beyond the face of the die body — an advantage in threading to a shoulder.

STYLE SAM Shank part of the body. Excellent heads for tapping machines and other machines where the die head can reverse.

STYLE SAMA For use on regular acorn die holders.

STYLE SAML For use on all sizes of Brown & Sharpe automatic screw machines. Comes complete with holder which includes an alignment feature and lateral float.

H & G SPEED CALCULATOR

Free to factory executives who write on business letterhead; others 15 cents

FOR ALL MACHINES ON WHICH THREADS ARE CUT

H&G

INSERT CHASER DIE HEADS

Manufactured by

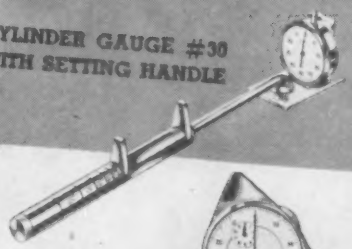
THE EASTERN MACHINE SCREW CORPORATION

27-47 BARCLAY STREET, NEW HAVEN, CONN.

General Purpose and Insert Chaser Die Heads, Threading Machines, Feed Fingers

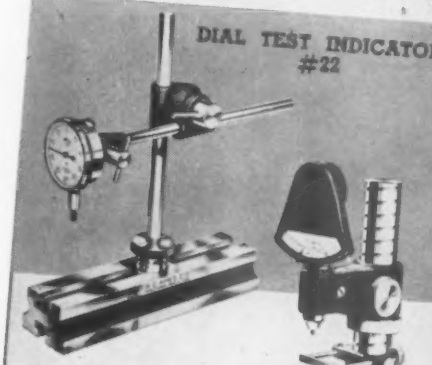
AMES THE OLDEST NAME IN DIAL INDICATORS

CYLINDER GAUGE #30 WITH SETTING HANDLE



CALIPER GAUGE #12

DIAL TEST INDICATOR #22

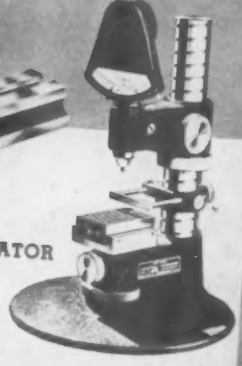


DIAL MICROMETER #27

DIAL INDICATORS ENGLISH OR METRIC

DIAL INDICATOR #211
4 Sizes — 14 Dials

DIAL COMPARATOR #26



DIAL COMPARATOR #1

Ames Gauges and Dial Indicators represent the best in quality, design, and workmanship that money can buy. The complete line of Dial Indicators, Micrometers, Gauges, and Comparators is shown in the new Ames Catalog No. 53. Write for your copy.

B. C. AMES CO., WALTHAM 54, MASS.

RED-E-TOOLS

SAVE MONEY
SPEED PRODUCTION
SAFEGUARD PRECISION

RED-E
HIGH SPEED CENTERS

Outlast and outperform ordinary centers many times over.

Examine this Red-E High Speed Center carefully. Note the generous proportion of High Speed Steel ...full diameter and with ample extra metal for many regrinding operations. High speed tip is electric butt flush welded to chrome steel shanks to give you a top quality tool throughout with extra service value built right in. Top quality centers are a small but mighty important investment. Write today for Red-E High Speed Center Bulletin No. E-45

THE READY TOOL COMPANY
IRANISTAN & R. R. AVENUES
BRIDGEPORT, CONNECTICUT

OTHER RED-E PRODUCTS YOU SHOULD KNOW...

CEMENTED CARBIDE TIPPED LATHE & GRINDER CENTERS with the RED-E Safety "Life Line"

HIGH SPEED STEEL CENTERS

RED-E NEW DEPARTURE BALL BEARING CENTERS

RED-E STYLE X LATHE TOOL with the Tool Steel Bearing

MILLING MACHINE & FACE PLATE DOGS

GRINDER DOGS

RED-E-TOOLS

Bulletins on any or all of these Products on request.

★ When the chips turn blue, the air frequently does, too, for it means a high speed tool bit needs regrinding. But chips don't come up blue when the proper coolant is used . . . and the best way to get coolant to the junction between tool and chip is with a Pioneer Pump.

Pioneer Pumps are "blue chip" performers on all heavy duty or high finish operations. Milling, turning, drilling, sawing, reaming, tapping, hobbing, broaching or grinding . . . every operation and every machine will benefit from the steady, adequate flow of coolant supplied by Pioneer Pumps.

There's a "blue chip" performer to fit any machine in your shop . . . for Pioneer makes 400 standard models of the longest-lived pumps ever built.

PIONEER MODEL MVBD

Seal-less model designed to mount on outside of coolant tank or machine pedestal. Intake is through mounting pad hole, eliminating intake piping. Three outlets permit piping to right, left or back into the coolant sump. Will stay primed and function efficiently in shallow places out of the reach of most pumps.

PIONEER Pumps
HIGH EFFICIENCY • LOW POWER CONSUMPTION
GREATER VOLUME AND LESS MAINTENANCE

Pioneer Pump & Manufacturing Co.
19645 JOHN R ST. • DETROIT 3, MICHIGAN

These Small Chicago Wheels MAKE INDUSTRY HUM!

CHICAGO GRINDING WHEELS AND MOUNTED WHEELS

Millions of whirling abrasive wheels, trained in war's tough school of precision finishing, each doing a prime job in laboratory, tool room, aboard ship, on production line. And—they're all set and eager to tackle civilian goods now that peace machinery is singing again.

Whether it's removing burrs, smoothing edges, squaring surfaces so accurately that the finish can be measured in micro inches, or cut-off work—there's a Chicago ready to do a top-ranking job for you.

VITRIFIED GRINDING WHEELS with a 50-year pedigree. Up to 3″ in diameter in various abrasives and bonds including the famous FV Bond.

MOUNTED WHEELS. The largest assortment made with a shape and abrasive to take care of every internal and external finishing job.

CUT-OFF WHEELS. All types and sizes. Now offered with the sensational new special-formula RT Bond (rubber or resinoid).

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CHICAGO WHEEL & MFG. CO.

1101 W. Monroe St., Dept. TE, Chicago 7, Ill.

SEND FOR TEST WHEEL

Learn first-hand about Chicago's superiority. Tell us what you have to finish, size wheel you'd like and we'll mail one promptly.

★ Half a century of specialization has established our repuation as the Small Wheel People of the Industry.

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Send Catalog. Interested in ☐ Grinding Wheels ☐ Mounted Wheels ☐ Cut-off Wheels ☐ Send Test Wheel. Size _____

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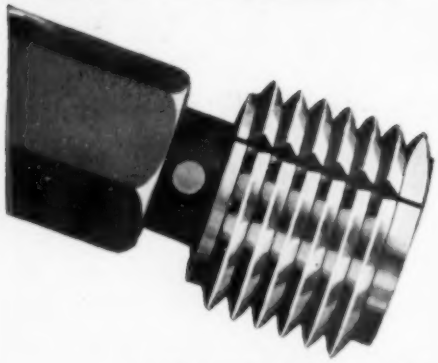
That Unseen Extra Quality



A Basket Ball Star Has It – The V-Nide Gage Has It –

That "UNSEEN EXTRA QUALITY" that does the exceptional is shown by the results obtained. Accurately compiled tests show less cost per hole gaged with Republic Gage Company's V-nide Thread and Plain Plug members. Write for folder.

Republic Gage Company

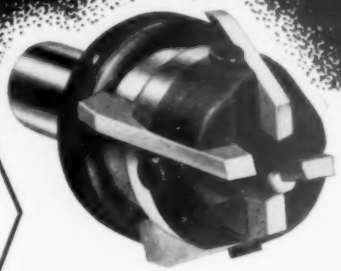
GAGES OF LONG LIFE ACCURACY

V-nide

2228 FENKELL
Detroit 21, Mich.

GENESEE

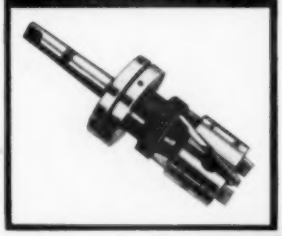
ADJUSTABLE HOLLOW MILLS WILL INCREASE YOUR PRODUCTION



STYLE M • Blades set at rake angle for cutting steel, aluminum, and other materials requiring rake.

INSERTED BLADE FACING & COUNTERBORING TOOLS

SPECIAL HIGH PRODUCTION TOOLS



• THERE IS A GENESEE for every hollow milling job. Available in 16 styles. Standard sizes from 0 to 2", with straight or Morse taper shanks carried in stock . . .

- Each size tool has 1/8 range.
- Blades quickly ground in a simple fixture.
- All tools manufactured of heat-treated alloy steel.
- Adjusting threads are ground from the solid and adjusting rings are lapped for extreme accuracy.
- Available with high speed steel, cast-alloy, or Tungsten Carbide tipped blades.

Genesee Tools will increase your production—35 years of know-how is yours for the asking . . . Write for complete catalog No. 45.

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GENESEE
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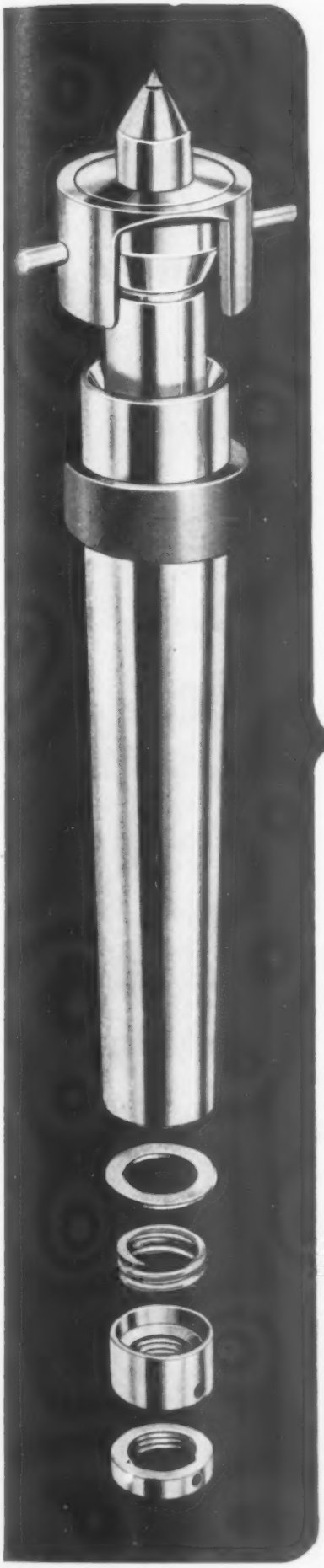
ADJUSTABLE HOLLOW MILLS • FACING AND COUNTERBORING TOOLS • SPECIAL PRODUCTION TOOLS



Speed Up

CYLINDRICAL GRINDING

Production of many kinds of cylindrical grinding can be more than doubled by replacing ordinary head stock center with a "CENTER DRIVE".

DOGGING OF WORK IS ELIMINATED. Knife edges of "Center Drive" firmly hold work and rotate it between dead centers. "Center Drive" acts as an integral part of piece being ground — permits grinding all diameters in one operation.

SPEED AND CONCENTRICITY ARE THUS ASSURED. Freed from the tedious "dogging" the operator has plenty of time to inspect his work and keep his machine at optimum adjustment.

AVAILABLE NOW FOR EVERYDAY GRINDING.

AND IF YOU HAVE A TROUBLESOME JOB — Send it to us — *at your present costs.*

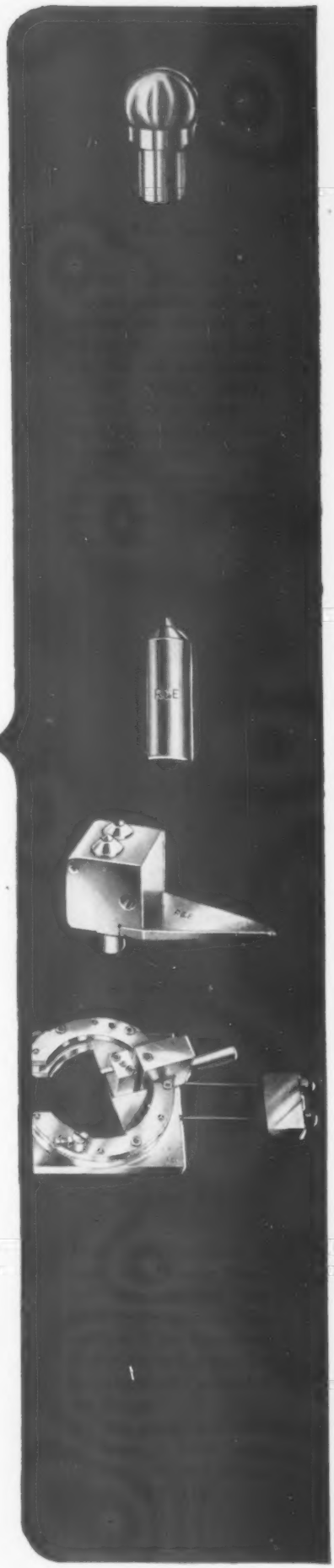
Our Engineering Service will develop a production technique — built around "Center Drive" — to speed up production and we will grind enough of the pieces so that the accelerated rate, due to "Center Drive" will absorb the development expenses. We will then turn the tools and technique over to you — AT NO ADDITIONAL COST TO YOU — or if you prefer, we will continue doing this work for you at a lower price based upon our actual costs.

Let us PROVE how a "Center Drive" and a Developed Production Technique can improve the quality, reduce the cost and SPEED UP your cylindrical grinding.

Our aim and intent — to provide an efficient world-wide organization to finance, develop, patent, manufacture and market new ideas and inventions.

J. R. FISH RESEARCH & ENGINEERING CO.

1341 MAIN ST., AGAWAM, MASS.
Phone — Springfield, Mass. — 6-3694



Straight Shank Subland Oil Hole Drill

Morse Taper Shank Subland Oil Hole Drill

Time Savers IN 2-STEP DRILLING

SUBLAND OIL-HOLE DRILLS

Because oil-hole subland drills have cutting edges that are always kept cool by a constant stream of oil, they permit much faster drilling than ordinary subland drills.

This is why their use is increasing by leaps and bounds in shops that are seeking new methods of reducing production costs.

All sizes from ½" to 3½" in diameter and up to 36" overall. Please specify taper or straight shank. We also specialize in the manufacture of all types of subland drills and reamers.

DETROIT REAMER & TOOL CO.
2830 E. 7-Mile Road
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Manufacturers of
Oil Hole Drills, Subland Drills, Special Reamers, Circularity Relieved Reamers, and End Mills. Also Special Tools.

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HILCO OIL RECLAIMERS
A simple, economical and fool-proof method of restoring contaminated oil to new oil condition – removes water and fuel dilution – continuous or intermittent operation.

HILCO HYFLOW OIL FILTERS
A superior oil filter for perfect filtering of lubricating, industrial and fuel oil – for continuous or intermittent operation.

HILCO AIRLINE OIL FILTERS
A perfect method for contact oil purifying complete re-refining to new oil values – removes fuel dilution and water. For continuous or intermittent batching from system or tanks.

HILCO units use Hilite for purifying mineral oils – *Hiltex or *Adstay for perfect filtering or additive and detergent oils. The HILCO line offers you a complete lubricating, fuel and industrial oil purifier service – Write today for free literature – let us help you take care of "That Particular Job."

* These items are available to present HILCO users who have changed over to the use of compounded oils.

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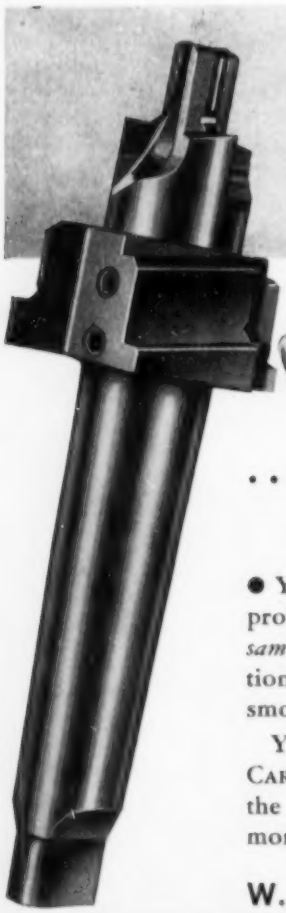
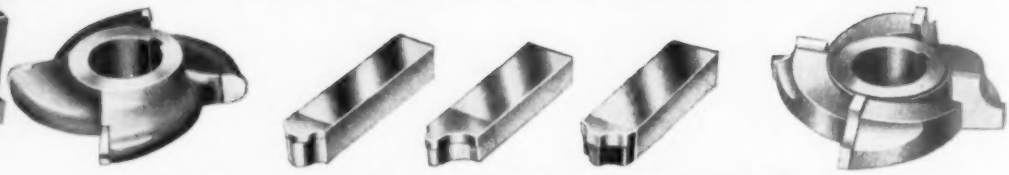
107 West Fourth St. Elmira, New York



Peacetime Production
MEANS BACK TO COMPETITION!



...and here are the tools that will give you the "edge" *on competition*...

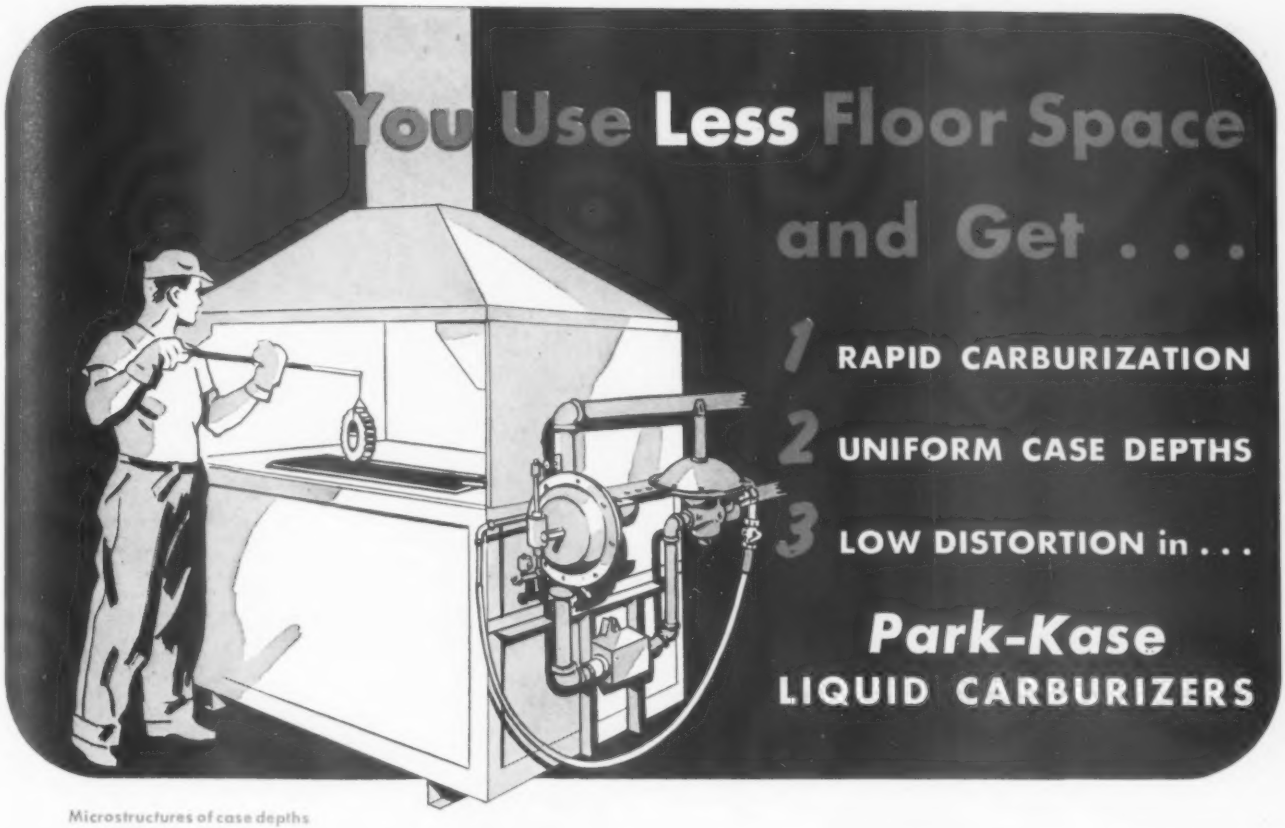
● Yes, peacetime production will have its problems, even as war production. Not the *same* problems, but just as tough. Competition will require tools that cut clean—fast—smooth—accurately.

You can depend upon MEYERS GENERATED CARBIDE-TIPPED FORM TOOLS to give you the "edge" on competition, by giving you more pieces per hour—more pieces between grinds—and a much smoother finish. On actual production runs, MEYERS GENERATED CARBIDE-TIPPED TOOLS have boosted production by more than 500%!

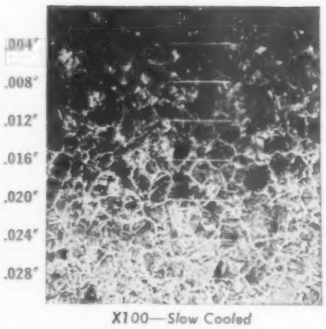
Send us your prints for quotation.

MEYERS GENERATED *Carbide Tipped* FORM TOOLS

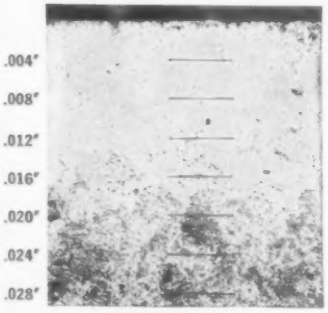
W. F. MEYERS COMPANY, INC. · *1024 14th St., Bedford, Ind.*



Microstructures of case depths produced by Park-Kase on AISI C1019 steel in two hours at 1600°F.



X100—Slow Cooled
(Reduced in printing)



X100—Brine quenched
(Reduced in printing)

RAPID CARBURIZATION is provided by Park-Kase. (See table below.) Case depths up to one-eighth of an inch are possible with suitable time-temperature cycles.

UNIFORM CASE DEPTHS are a result of the rapid and even rates of heating obtained in Park-Kase.

LOW DISTORTION is guaranteed by the rapid and even heating, uniform case depths, accurate temperature control, and ease of direct quenching from Park-Kase.

SIMPLE OPERATION of Park-Kase requires no rigid chemical control or strict replenishment schedule. Complicated equipment and highly skilled personnel are not necessary.

SELECTIVE CARBURIZATION in Park-Kase is accomplished with No-Kase (a special stop-off paint) or copper plating.

ECONOMICAL operation of Park-Kase results from the incorporated carbon cover which inhibits salt decomposition, restricts fuming, and saves fuel by preventing excessive heat radiation.

TOTAL CASE DEPTHS ON SAE 1020

Time	1500°F.	1550°F.	1600°F.	1650°F.	1700°F.	1750°F.
30"	.007"	.0085"	.0105"	.012"	.014"	.016"
1 Hr.	.012	.015	.017	.019	.021	.028
2 Hr.	.017	.021	.025	.029	.032	.040
4 Hr.	.024	.029	.035	.041	.047	.060
6 Hr.	.030	.036	.043	.052	.060	.071

Park
CHEMICAL COMPANY
8074 Military Ave., Detroit 4, Mich.

● Liquid and Solid Carburizers ● Cyanide, Neutral, and High Speed Steel Salts ● Coke ● Lead Pot Carbon ● Charcoal ● No Carb ● Carbon Preventer ● Quenching and Tempering Oils ● Drawing Salts ● Metal Cleaners ● Kold-Grip Polishing Wheel Cement.

LICENSED MANUFACTURER: Electric Resistance Furnace Co., Ltd., Weybridge Surrey, England

AUTOMATIC

- STOCK FEED
- CLAMPING
- WHEEL FEED
- ADJUSTMENT FOR WHEEL WEAR
- EJECTION

...AND HERE'S A TYPICAL JOB

• To finish cut rollers for bearings from 52/100 bar stock to close tolerances. Former method required grinding ends. With this new Model 700 AUTOCUTTER the job is done automatically, one operator running a number of machines. No grinding is necessary.

This line of fully automatic abrasive cutting machines is the solution to many problems of production cutting of short pieces with finished ends and to close tolerances. Model 700 cuts up to ¾" stock—Model 725 up to 2½".

IF YOU HAVE A CUTTING PROBLEM

Write and tell us (1) the range of sizes, (2) kind of material, (3) length of cutoff pieces, (4) length of stock before cutting, (5) tolerance for length of cut pieces and (6) hourly production requirement. With this information, CAMPBELL engineers can recommend production procedure and work up cost sheets for you.

Campbell

ABRASIVE CUTTING MACHINES

ACCO

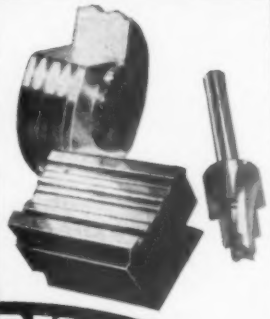
ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

ANDREW C. CAMPBELL DIVISION
AMERICAN CHAIN & CABLE
BRIDGEPORT, CONN.

TRADE MARK

ENGINEERED TO THE JOB ... PRECISION MADE FOR EXACTING PERFORMANCE AND *Mastercased** TO GIVE UP TO

500% LONGER LIFE



MASTERFORM

HIGH-SPEED *Mastercased CUTTING TOOLS

Meet the Challenge

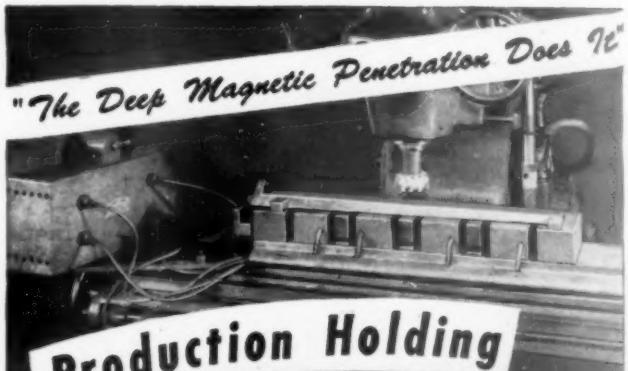
**Mastercasing...*

That's our improved super-heat-treating process which adds to the life of Masterform cutting tools...will multiply your production...will divide your costs per cut.

Want proof? Write, wire or phone for name of nearest-to-you factory representative...or without the slightest obligation, send specifications for estimates and complete information.

MASTERFORM TOOL CO.
2550 IRVING PARK ROAD • CHICAGO 18, ILL.
OUTSTANDING ENGINEERING SERVICE AND CRAFTSMANSHIP

"The Deep Magnetic Penetration Does It"



Production Holding WITH ROCKFORD POWER-GRIP CHUCKS

With Power-Grip, speed and accuracy on close work can be attained without costly fixtures. For surface grinding, planing, shaping and milling, here is inexpensive equipment that simplifies material holding to the extent that savings effected in only one month often amount to many times its cost.

Knotty Holding Jobs Simplified
Costly Time Lags Eliminated

WRITE FOR THE POWER-GRIP BOOK

ROCKFORD MAGNETIC PRODUCTS COMPANY
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Service with a punch!

● Allied's R-B Interchangeable Punch and Die is "standard" in metal working and plastic industries. Standard shapes and sizes carried in stock. Illustrated are four of the thousands of specially-designed punches we have made. Special R-B punches and dies made in any material, shape or size desired. Send for large, illustrated R-B catalog, now.

ALLIED PRODUCTS CORPORATION

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Again! **PARKER-MAJESTIC**

Leads **WITH NEW TIME SAVING FEATURES**

(PAT. PENDING)

No. 2 SURFACE GRINDER

Adaptable to all precision tool room jobs ● 7 spindle speeds from 2000 to 6000 R P M ● quick and positive crossfeed saddle locking, for spline or form grinding, without saddle distortion ● grinds work to 18" long, 6" wide, and 9½" high, using a wheel 7" in diameter.

A Wise Buy For a Careful Buyer

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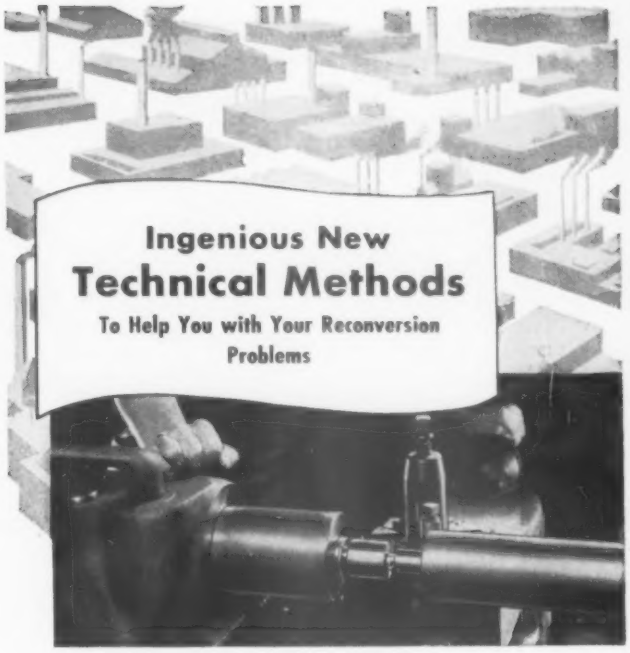
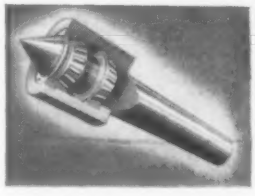


Ingenious New Technical Methods

To Help You with Your Reconversion Problems

New Precision Built Roto Center Eliminates Chatter . . . Speeds Production!

Now you can replace dead centers on lathe and grinder tailstocks, with this new Keene live Roto Center—to increase production—to eliminate all radial play and possibility of chatter! Low in cost, the Roto Center is a high capacity unit, featuring many innovations to speed and improve quality of work!



The Keene Roto Center

Matched roller bearings preloaded, are packed with high grade anti-friction grease at assembly. No attention is required for long periods. After assembly, runout is kept to absolute minimum—guaranteed less than .0002. Rear of center is tapped to receive standard hydraulic fitting. Chips, dust and cutting oil cannot reach bearings!

More and more peacetime "helps on the job" are returning to industry. One of these days, famous, flavorful Wrigley's Spearmint Gum will also be back to help you "on the job"—but only when we can assure Wrigley's Spearmint manufacture in *quantity* and *quality* for all. Today, we ask you to remember the famous Wrigley's Spearmint wrapper. Tomorrow, you may again enjoy Wrigley's Spearmint Gum quality and flavor while you are at work.

Remember this wrapper

You can get complete information from Keene Electrical Machinery Co., 549 W. Washington Blvd., Chicago 6, Ill.

Z-95

MARVECO

LONG LIFE ACCURACY

The first MARVECO sold is still in operation. It has never been repaired and a recent check shows a runout of .0003.

The MARVECO is GUARANTEED to OUTPERFORM and OUTLAST any other LIVE CENTER.

Our illustrated catalog will be sent upon request. See for yourselves the MARVELS of MARVECO.

Send us Your

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MARVEL TOOL & MACHINE CO.

10981 W. JEFFERSON AVE, RIVER ROUGE 18, MICHIGAN

FOR EXTRA SPEED AND ECONOMY

Replace those old-style solid cutters

Once the present back-log of unfilled orders disappears and we return to a buyer's market, shops with up-to-the-minute equipment will get the business with far less expense than will those still clinging to old-style, worn-out tools.

You will have a head start if you will begin by replacing your outmoded solid milling cutters and lathe, planer and shaper tools with O K Inserted-Blade Metal Cutting Tools. In these tools, only the cutting edges are made of the less expensive, but exceedingly strong, alloy steel. The blades or bits that do the cutting may be readily adjusted in line of wear—replaced with others from the tool crib—or shapes may be ground for special jobs. With the O K System, you handle a wider variety of work—get more out of your tools—DO A BETTER JOB!

An O K Milling Cutter for milling locomotive side rods and other heavy duty jobs. One of scores of O K designs of milling cutters.

INSERTED-BLADE METAL CUTTING

OK TOOL SYSTEM

MANUFACTURED ONLY BY THE O K TOOL COMPANY, SHELTON, CONN., U. S. A.

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We're Working 'round the Clock!

TO KEEP UP OUR STOCK OF WETMORE TOOLS FOR YOUR PEACETIME PRODUCTION

The many features which have made Wetmore adjustable inserted blade tools wartime favorites, mean lower costs in peacetime production.

WETMORE REAMER CO.

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LSTAS

Send for

The facts outlined in this booklet are taken from hundreds of actual cases showing the surprising variety of tools which can be improved by modern treatments. Among the several processes mentioned are:

"SILVER FINISH"—which is clean, bright hardening . . . no oxidization or scale.

"NUSITE" — starts with soft high-speed steel and means harder, tougher cutting tools.

"AD-LIFE"—a combination of supplementary treatments to improve hardened finished tools . . . even new ones . . . no rehardening is required . . . no danger of fracture or distortion.

What manufacturers of tools, air planes, trucks, gears, steel molds, food machinery, electrical devices, and many other fields did to improve tool quality and life is told in this valuable booklet.

PERFECTION
TOOL & METAL HEAT TREATING CO.
1740-58 WEST HUBBARD STREET CHICAGO 22, ILL.

POWER FEED For Facing

BORING, TURNING, FACING, UNDERCUTTING COMBINED IN ONE TOOL HEAD

The power feed feature for facing operations insures smooth, uniform movement of tool across work surface. This power feed can be engaged or disengaged instantly. **Adjustment** of tool for boring is obtained in increments of 1/10,000 in direct reading.

Pat. No. 2,356,651

For Jig Borer, Drill Press, Milling Machine

- **ALL OPERATIONS IN ONE SET-UP**

Cutting bar can be set to any position in Tee slot of slide. Hardened and ground throughout. Feed screw and worm ground from solid. Gears and feed nut phosphor bronze. Head 3" dia. x 4" long. Wt. 9 lb. Any type shank furnished. Write for complete information.

CHANDLER TOOL CO.
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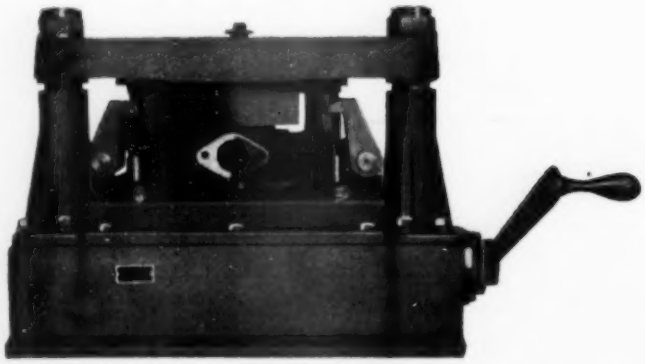

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Heavy duty built up type fixture drilling manifold. All locating, chucking and clamping is done by the movement of operating lever.

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ALL TYPES OF SHOP PRODUCTION TOOLS

STANDARD FIXTURES AND FIXTURE LOCKS

SWARTZ TOOL PRODUCTS CO., INC.

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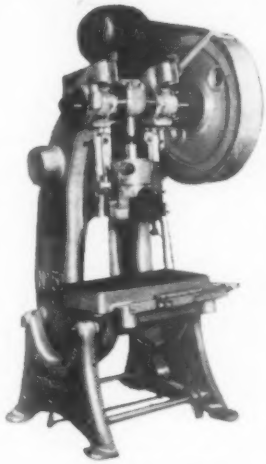
Philadelphia, Pa.—Morgan Tool & Equipment Co.

Walsh PUNCH PRESSES



For 38 years soundly engineered Walsh Punch Presses have been yielding maximum profits. Thousands in use. Check these features:

Stability—heavy duty semi-steel frames.

Inclinability—positively locks in any position.

Crankshafts—forged alloy steel, normalized and ground.

Slide and Gibs—scraped to .002 alignments between press bolster plate and slide-bottom surface. Slide has solid surface for accurate alignment of die shoe. Die shank is clamped into slide by means of circular clamping.

Safety Locks on crankshafts prevent operation while changing dies.

Drive—multiple V-belt; can be adjusted while press is running. Motor has overload relay.

Write for full information.

The Best in Power Presses since 1907

WALSH PRESS & DIE CO.

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"ROCKWELL" *Superficial* HARDNESS TESTER

MANY important plants have greatly increased their use of the Superficial type of "ROCKWELL" Hardness Tester. This is because its light loads and more sensitive depth measuring system permits equally accurate testing but bases its readings on material nearer to the surface. Where steel must sustain wear the condition of it near the surface becomes of prime importance. There are now over 5,000 "Superficial" machines in use and they are just as durable and just as quick and easy to use as the regular "ROCKWELL" Tester."

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The micrometer dial of the insert has 25 graduations, each being one-thousandths of an inch.

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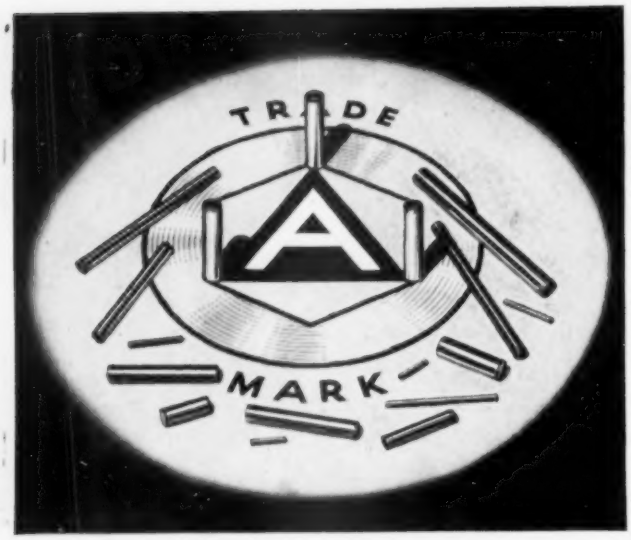

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All you know to be symbolized by the ALLEN trade mark,—in metallurgy, precision workmanship, product-DEPENDABILITY, — all this applies to *TRU-GROUND* Dowel Pins *in these particulars:*

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Allow Tool Adjustments in Multiple Spindles—

These adapters have proved their worth over the years and are now commonly used in multiple spindle operations. Are you using the type best suited to your needs?

Adjustment is made by nut on Acme threads, positive drive through Woodruff Key and hold back friction through Allen set-screw. They allow for tool adjustment in any spindle where used —make your machines more flexible.

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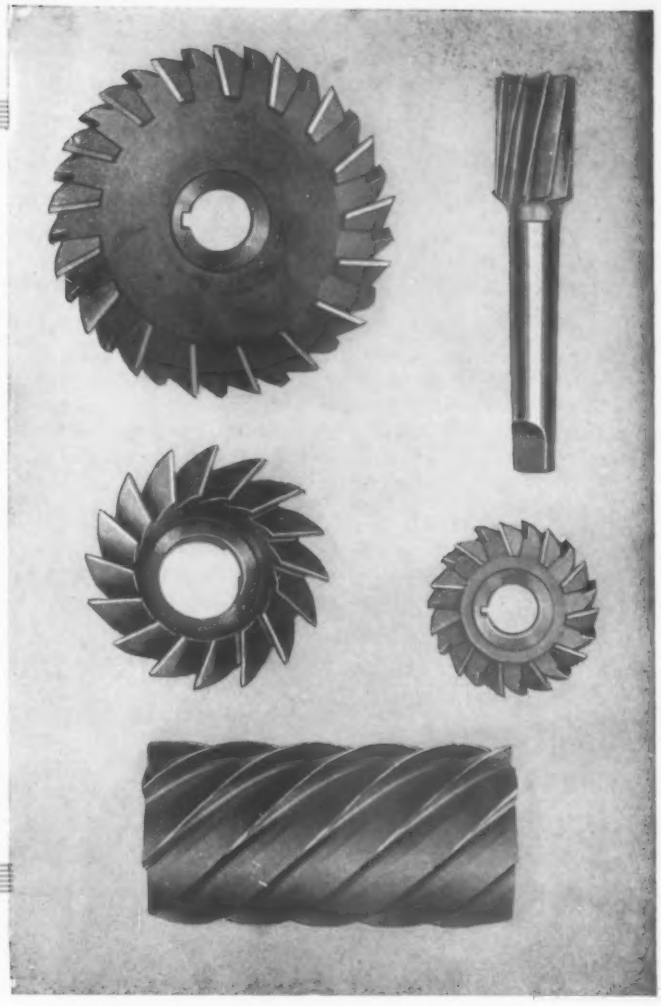

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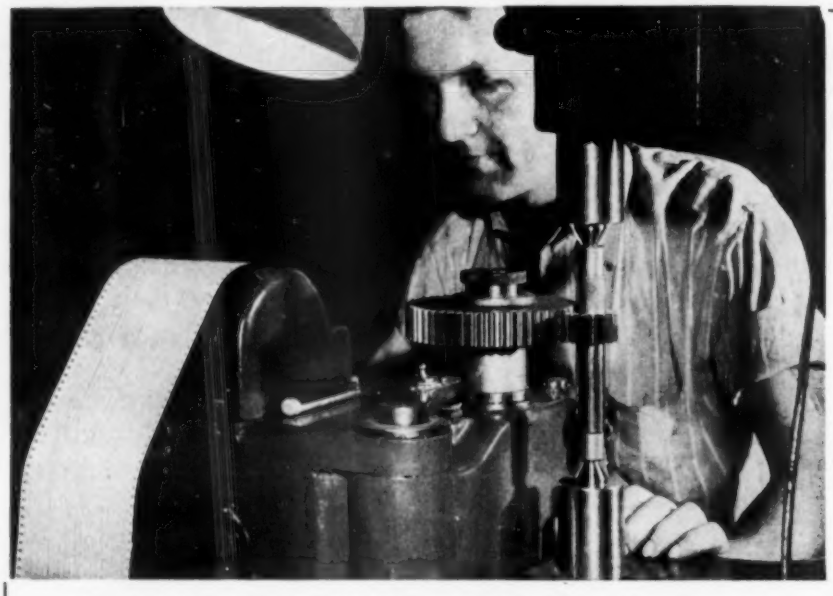

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In the spectacular production of airplanes a vitally important phase is the manufacture of gears to tolerances hitherto unattained. The tremendous speeds at which the gears operate make it essential that they be as nearly perfect as possible. While highly efficient manufacturing methods have been developed and are in use, it is still necessary to check each gear. Such characteristics as eccentricity, tooth profile, center distance and tooth spacing are checked by the use of master gears.

The illustration (left) taken at the plant of the Wright Aeronautical Corporation at Paterson, New Jersey, shows the care that is taken in checking their product. Wright engines using gears cut by National Cleveland gear shaper cutters and hobs and checked by National Cleveland master gears have achieved a high place in the annals of American aviation.

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Specify drill size, O. D., and length in order named. Also bushing number.

Bushing above 1¾" hole size will be quoted upon request. In ordering special bushings, forward blueprint showing all dimensions and limits.

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These Drill Jig Bushings are made of high grade tool steel—Rockwell C-62 to 64 hardness.

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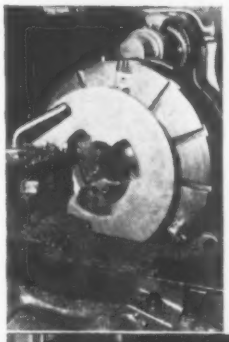
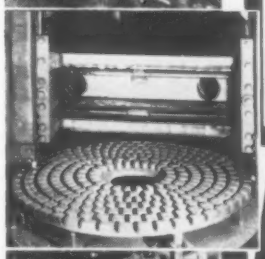
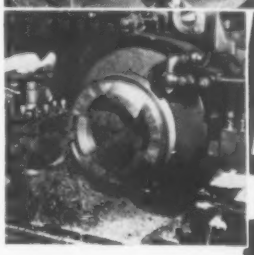
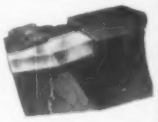
Kennametal Grade K6 is one of the most useful and needed recent developments in tool materials for machining cast iron and non-ferrous metals. It is an improved tungsten carbide having unusual strength in combination with exceptional abrasion-resistance and high hardness. The four performance studies outlined below are typical of scores of comparative service results that clearly show the superior properties of K6 for interrupted and continuous cutting on cast iron.





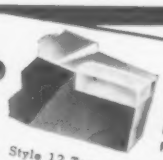


MULTIPLIES OUTPUT, ON FACING OPERATION, ON SANDY IRON CASTING



Replacing another make of carbide with a Style 11HD Tool having a clamped-on, advanceable K6 tip, made possible tripling the feed, doubling the cutting speed, and facing 8 times as many pieces per regrind. Operation—facing sandy iron castings. Feed—.036". Depth of cut—1/8" to 3/16". SFM-150 at start, 320 after tool entered cut.

REMOVES TONS OF METAL FROM CHILLED CAST IRON PARTS, AT TOOL COST OF 74 CENTS PER TON



Style 12 Tool with K6 tip turns 1⅛ lineal miles between grinds! Other makes of carbide failed at all speeds and feeds. After 10 regrinds K6 tip is used on lighter jobs. Operation—turning cast iron piston trunks, 21⅛" diameter, having six 3" or 4" ports (interrupted cut). Chilled around port holes. Very sandy surface. Feed—.09375". Depth of cut—⅛". SFM-120.

CUTS 35 PIECES (on Abrasive Electric Iron) AS AGAINST 3 FOR CARBIDE PREVIOUSLY USED

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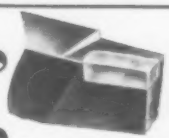
TURNS OUT 10 TIMES AS MANY PIECES, ON ROUGH CASTING, BETWEEN REGRINDS



One to four pieces between grinds was the best performance recorded by other carbides on machining a webbed flange of inferior grade cast iron, having hard spots, and sand pockets. K6 turns out more than 40! Operation—turning outside diameter and facing both sides of hub and rim. Feed—.032". Depth of cut 1/16" to 3/8". SFM-280.

The best way to prove that K6 makes possible better, faster machining on cast iron, at lower tool costs, is to try it in your own shop—then compare tool performance and overall costs. Order a few Kennametal blanks, or complete tools, now—and ask our district field engineer, who is fully acquainted with the properties of K6, to help you get maximum results from this *new* and *improved* tungsten carbide—Kennametal Grade K6.

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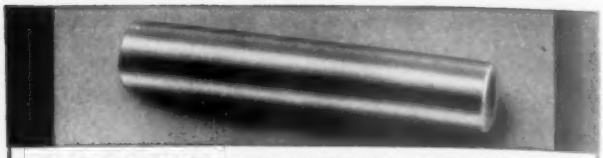

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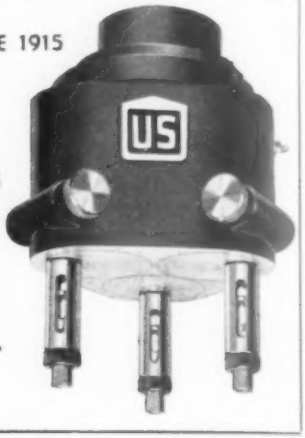

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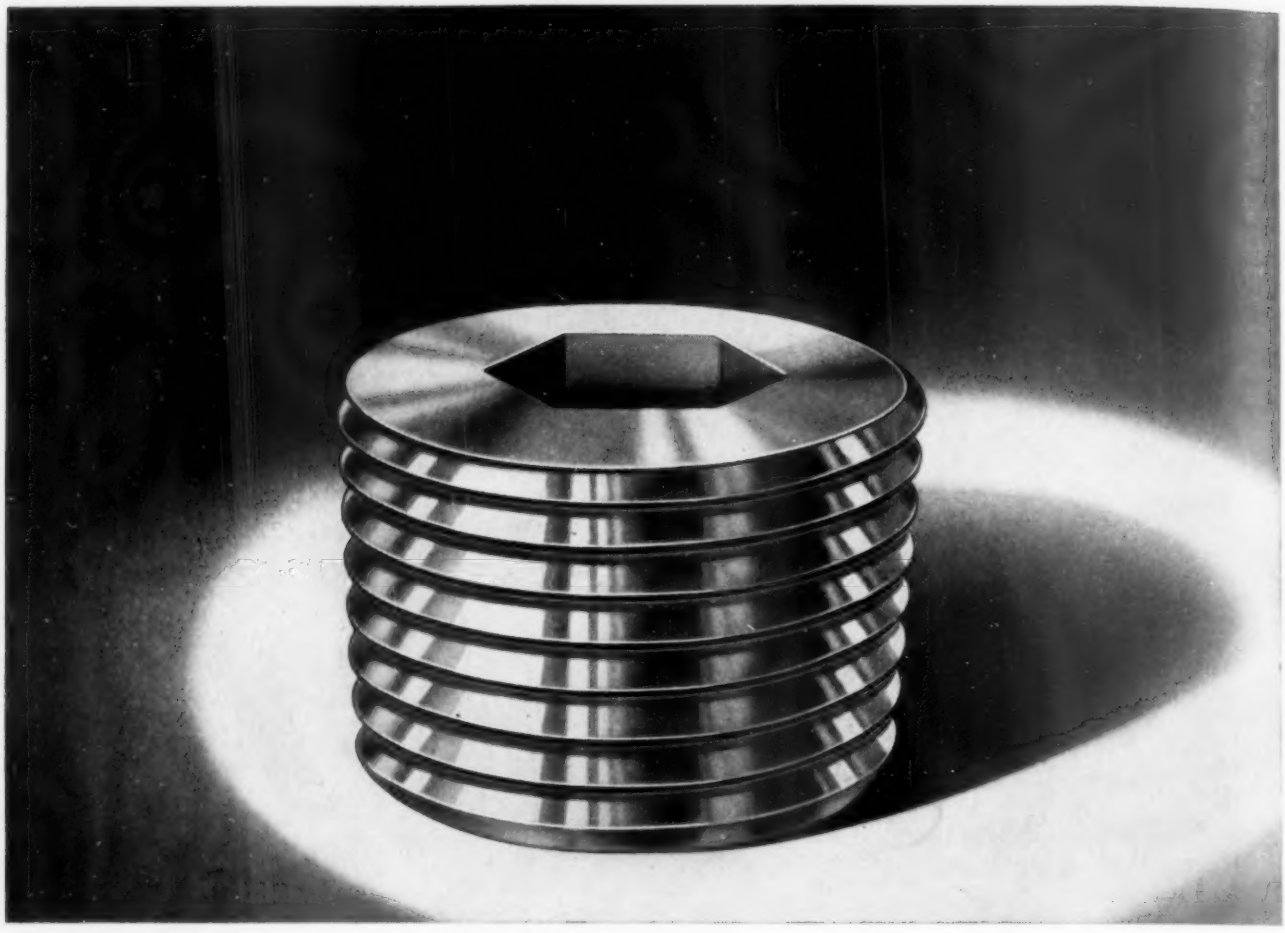
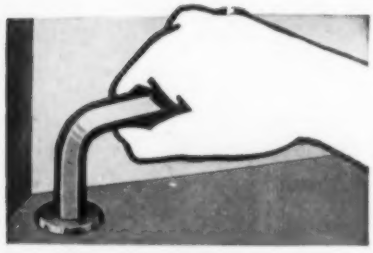


H-K SOCKET PIPE PLUG



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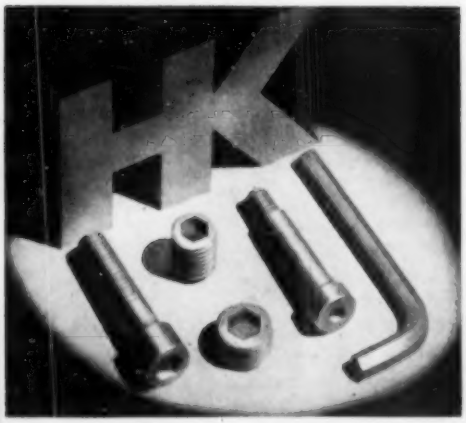
For hydraulic applications, motors, refrigerator units, etc. wherever a plug must properly engage the tapped hole, preventing leakage under all conditions . . . H-K Plugs are made from chrome nickel alloy steel, scientifically heat treated, accurately threaded, correctly chamfered and rigidly inspected, gauged and checked thru each step in production . . . Specify "HOLO-KROME" and get this precision and the answer to your Pipe Plug problems.



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SOCKET SCREWS

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Many case histories, such as the one featured here, demonstrate the versatility of New Britains at work . . . forecast their productive value in the years ahead.

A typical example is the Main Drive Gear Bearing Retainer pictured here. The number of cuts required, the need for economy of operation and speed of production with rejects held to a minimum posed a problem which was solved by the selection of New Britain Model 675 Six Spindle Automatic Chucking Machines.

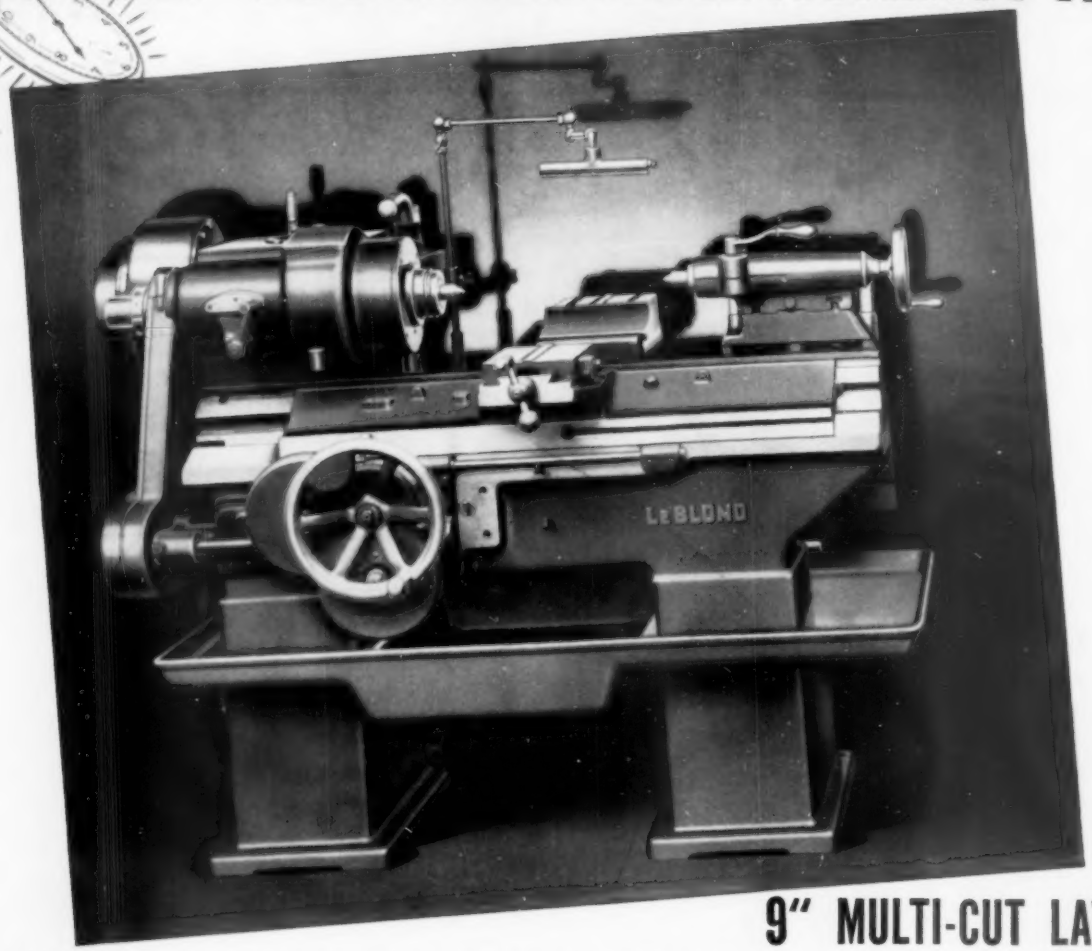
The first problem was to place tools so that this cast iron piece could be loaded, and the bore and flange completely machined in the first four stations. The number five station carried a multiple drill head that machined the three holes in the flange at one time. The sixth station carried a collapsing tap for putting in oil grooves. This right hand spiral groove was 3/32" wide and 1/16" deep, and had to be held concentric with the bored and turned diameters within .002 total indicator reading. Sixteen operations in all, performed in 15 seconds, with gross production of 240 pieces per hour.

This is another case where the versatility and advanced engineering of New Britains solved a difficult problem. In peacetime production they will solve many more . . . yours too.

NEW BRITAIN AUTOMATICS

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT
NEW BRITAIN-GRIDLEY DIVISION

TO HELP YOU IN THE RACE AGAINST TIM



9" MULTI-CUT LATHE

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